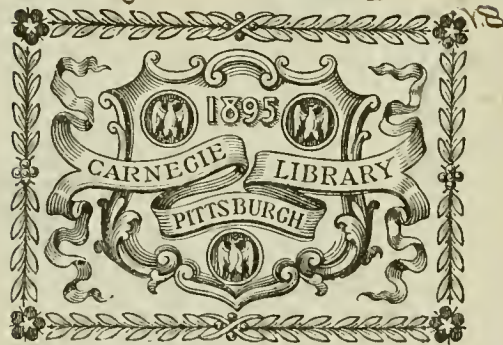






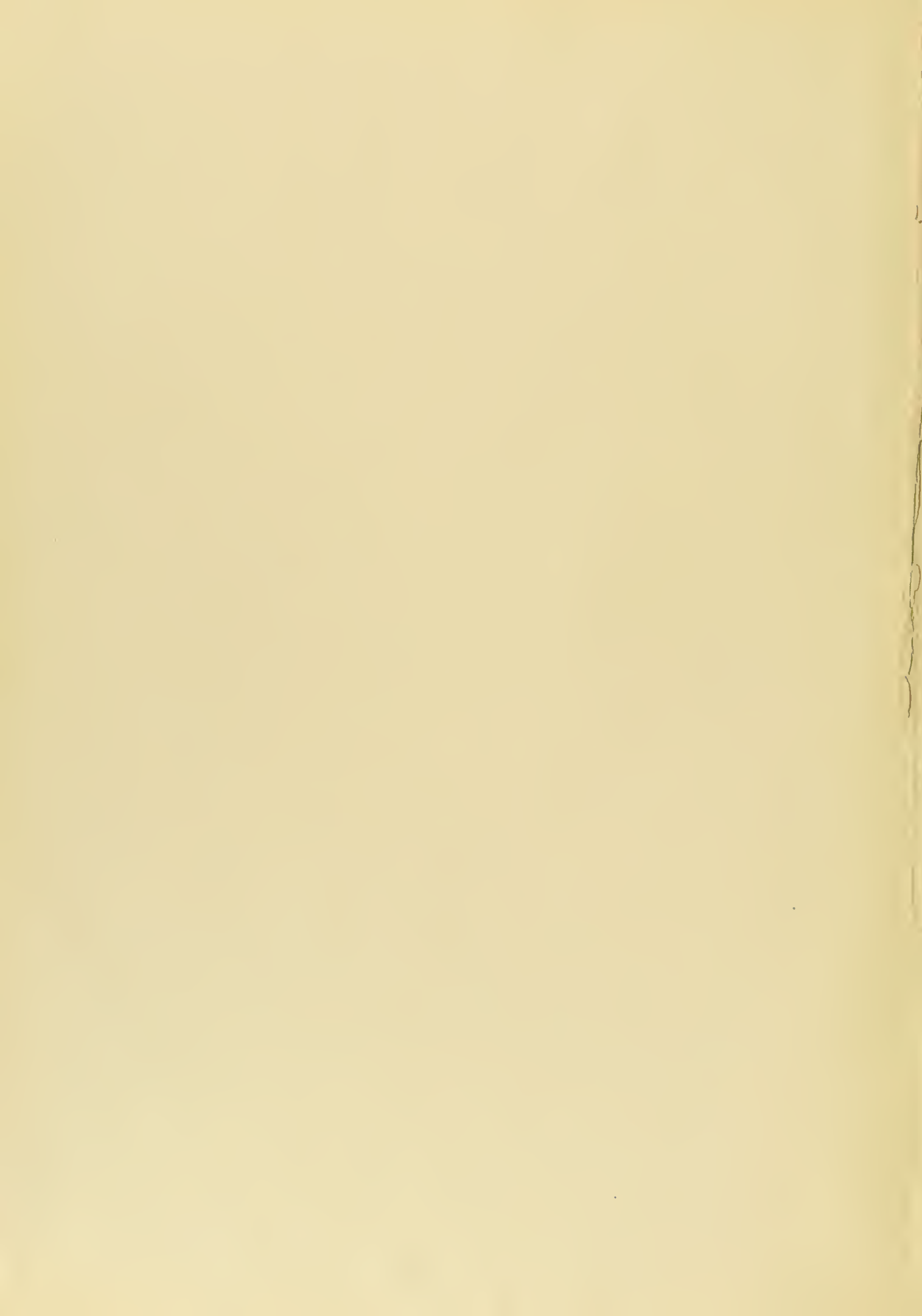
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THE  
STREET RAILWAY  
REVIEW

INDEX TO VOLUME VIII

1898

CHICAGO

WINDSOR & KENFIELD PUBLISHING COMPANY

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### CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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The City Council of Chicago, undertook to inaugurate a wholly unwarranted inspection of the private affairs of the street railway companies, which concerned none but the companies and their stockholders. The presidents, politely but firmly, declined to answer the questions propounded, and the august body and its officious committee are placed in a very ludicrous and ridiculous position in consequence.

Saginaw, Michigan, thought it did something clever when it secured an order directing the receiver of the road there to institute a low fare schedule. This was last August. The receiver finds it more than even an officer of the court can do to run a road on 3-cent fares, and the order will be rescinded. All the law and courts in the land cannot get something out of nothing, which is only another way of stating the problem that you can't give a 5-cent ride for a 3-cent fare and pay men and bills.

A professional witness has been brought to grief in Chicago. He offered his services to one of the street railway companies and was promptly reported to the court by whom he was remanded to jail until the case in question is settled. Then the court will make a case of him. It is earnestly to be hoped such an example will be made of the offender, as will teach those of his class that the manufacture of evidence is punishable as severely as another species of counterfeiting. It is the duty of every street railway to expose to the

fullest extent, and secure the heaviest punishment possible for, every such ease which is brought to them.

The city fathers in Cleveland in hunting for something with which to make trouble for the street railway lines thought they had struck a lead in the wires used by the roads for the sale of power, and ordered the roads to cut the same. This the companies declined to do, and the mayor directed the public works warden to do so. When that official investigated the matter he found the city was being supplied without cost with power for operating its swing bridges, and the wire-cutting scheme is not so popular around the city hall as it was at first.

In February, 1897, we published an account of a personal injury case against a New Jersey street railway, which was compromised by the injured party in violation of an agreement with his attorney. The attorney then sued his client for money advanced by him in the prosecution of the claim and was non-suited on the ground of the agreement being "barratrous, champertous, for maintenance, and against public policy." In this issue is an Illinois decision holding that any contract preventing a client from settling or discontinuing a suit is void because it would foster litigation. The old restrictions against barratry have been removed so that a contingent fee contract will be sustained in most states, but it is evident from these two cases that the courts do not look with favor upon the "accident attorneys" who hover in the wake of personal injuries to feed upon them. The rule in Illinois will probably prove very discouraging to this class.

On a western road the men employed largely belong to a union, and one of the agreements between the company and its men was, that where an employe was dissatisfied with the ruling of the office, the case should be appealed to a board of arbitration, one member of which was to be chosen by the company, one by the union, and a third by these two. At the time the agreement was made the company very reluctantly yielded, stating then, that it had no confidence in the decision of the board of arbitration being any more satisfactory than under the old system, where the manager was the judge. The men, however, knew if only they could have arbitration everything would be lovely. Recently a case came up for arbitration, which was so apparent it left nothing to arbitrate, but the board was appealed to, and upheld the decision of the manager in full. Now the union are highly displeased and say no justice can be had from arbitration. The outcome is quite what might have been expected, and shows the folly of any company delegating to outsiders those matters which its officers of all persons, are best qualified to pass upon.

On another page will be found a portion of the argument of Everett W. Burdett presented to the special committee on the "Relations of Street Railway and Municipal Corporations in Massachusetts" in behalf of the street railways of the state. We regret our inability to lay the whole of Mr. Burdett's speech before our readers at this time, for it is well worth the most careful consideration; but we must be content with submitting the arguments on but six of the 20 heads into which the discourse was divided. These deal with the growth of the street railways of Massachusetts in the last 30 years, and more particularly in the last decade:

with the history of the highways and the status of street railways therein; with the use of the highways as an alleged reason for subjecting the railways to special taxation; with the question of the alleged increase of the cost of maintenance of the streets because of their use by street railways; with the burdens imposed on the street railways, and with their inability to bear any additional burdens. The facts as to cost, mileage, traffic, operating expenses, profits, etc., are exhibited in a number of tables, and the climax is reached in the statement that: "The introduction of electric traction has not increased the net results of operation." In Table E it is shown that the dividends paid have varied but little since 1886, while as shown in Table F, the surplus has been cut down from 15.01 per cent to 1.66 per cent of the capital stock. It is of course true that the advancements and improvements in the operation of street railways in these 10 years have been almost infinite. The inevitable conclusion follows that it is the employes and the patrons who have benefitted thereby.

We note this month the street railway men of Illinois have followed the example of their brethren in New York, Ohio, Connecticut, Massachusetts, Pennsylvania, Michigan, Texas, Maine and California, and organized a state association. The plan for such an organization in Illinois has been broached before and the subject agitated more or less for the last 10 years. The excellent work of the National Association is ably seconded by that of the state organizations, which are thus enabled to take up matters of importance to the individual members, but which, naturally, could hardly be considered in the national meeting on account of being chiefly of local interest. These local interests, however, are often vitally important to the roads, and this is where the state organizations become necessary. In addition, there are many who cannot go so far away as the National meeting requires, but who all the more feel the need of acquaintance and conference with other managers. Not a manager but can spare the one day and short trip necessary to be present at a state meeting. While Illinois has been among the last to organize, we may expect the lost time will more than be balanced by the earnestness and enthusiasm displayed in the organization meeting.

On another page will be found a brief description of the system of discipline for trainmen adopted by the Metropolitan Elevated, of Chicago, and it is interesting to compare this system with that in use on the Canal & Claiborne road in New Orleans, discussed by Mr. Davis in his paper before the American Association at the Niagara Falls meeting.

On both, as on nearly all large roads, one of the preliminaries to securing employment is the passing of a physical examination; also the candidate gives a brief account of his previous history, as his experience with other employers, the length of time he was so employed, and the nature of the employment, all of which serves to advise the manager as to whether this particular applicant will make a good man for the company. On both roads the distinctive feature is competition, and promotions are made on the men's records. The competitive feature is introduced earlier in the man's career on the Canal & Claiborne, however, and the manner in which comparative standing of the men is reduced to the record is different.

The applicants for positions on the Canal & Claiborne are given a competitive civil service examination and only

the fittest chosen. These preliminaries being passed successfully the record is made by averaging daily reports as to each man's conduct, each petty officer, (foreman, starter, inspector, etc.) making reports to the office as to all the men with whom he comes in contact. In addition to this report of general conduct special acts are reported and are entered on the record according to a fixed scale, as merits or demerits. At the end of the month the record is balanced and if the sum total is below zero the employe is discharged. Promotion among a class of employes is made on the record alone, and motormen and conductors are also promoted to starters, inspectors and transfer agents on their records without examination, no attention being paid to the date at which a man entered the service. All vacancies in the service are filled from among the employes, if one with the requisite knowledge and ability can be found. For the higher positions competitive examinations are made the test.

In the system in use on the Metropolitan, of Chicago, seniority in point of time, as well as conduct, has weight in determining a man's position, and his chances of promotion. This appears in the following manner: If an employe is reported for violations of the rules his record suffers. If he is reported for a meritorious act his record gains. If his conduct has been according to the standard, that is, he has been caught doing neither good nor evil, his record is increased by 2 per cent, because the standard set by the rules is considered high enough to warrant this reward for a compliance with it. It thus appears other things being equal the senior employe has the advantage, which is as it should be, when "other things are equal." It may be said that this adding of 2 per cent is but another way of reaching the same result as is achieved by Mr. Davis, the value of a careful observation of the regulations being fixed and credited unless a violation be reported; the New Orleans method is to take the judgment of all the superiors as to the quality of the man's service, a method involving more labor. On the Metropolitan promotions from grade to grade in the train service are on the record alone as is the case in New Orleans.

It is a truism that for the greatest good to the company there must be good will and zeal on the part of the employes, and this state of affairs will naturally follow fair dealing and impartiality on the part of the company. Punishment there must be for violations of regulations and for carelessness, and it should be sure and swift; on the other hand nothing yields such good results as proper recognition of meritorious acts. Both of the schemes of discipline referred to have given excellent satisfaction on the roads where they are in use and deserve the careful study and consideration of managers.

In many of our cities the continued and wholly unwarranted and unjust attacks made by the local press upon the street railway interests have worked great damage to the city. Such papers seem to think they strike a popular chord when they abuse the management, the service and the property, when the chances are ten to one the road has done better under the conditions of earnings and expenses than any private business man would have thought he could do with decreased earnings and increased expenses.

Whatever improves the street railway helps the town; usually the money to do this has to come from the outside, and is just so much added investment from which the city



will receive taxes and the public increased facilities and accommodations. Whether these attacks are made ignorantly or knowingly, the result on the people in money centres, where the company is trying to place its securities, is the same. And the public will serve its own selfish interests if it would assert itself and compel the papers to deal fairly.

What would the public think if, when a new factory or industry which was to give added employment at good wages through the entire year was being promoted, the papers came out and stated the town had all the factories it needed; that the new work for unemployed men was an outrage, and that because the men who talked of investing their money lived in hopes of some return on their venture, that they were thieves and ought to be locked up? Yet this is precisely the tenor of some papers toward the street railway of their city under similar circumstances.

We have previously stated that the daily press of Chicago has worked untold injury to the city through its outrageous attitude toward the street railway interests. The latest instance is of a certain daily which makes out the Northwestern Elevated as one of the most irresponsible and unworthy ventures ever attempted here. The company has now retaliated and entered a damage suit in the sum of \$500,000 and retained the best legal talent in the city to push the case. The construction of the road means transportation facilities to many square miles of territory where the people have been at the mercy of the steam roads for the past 30 years; it means millions in the enhancement of small properties held by men whose homes are their all; the construction already erected is as good as any in the world and has already cost upwards of \$5,000,000. Now, when the management is closing arrangements for its completion and operation, this paper comes out with a statement which would make any but one thoroughly acquainted with the truth so afraid of it he would not want to pay 60 cents for a gold dollar.

We hope to see heavy damages awarded in the case, and such a lesson taught that others will be made to realize they cannot trifle with legitimate business interests for mere sport or blackmail.

The president of the road, D. H. Louderback, says: "So far as these roads are concerned we're going to stop this thing of newspaper libeling. We've no objections to the truth being printed about us, but they've got to stop lying about us. No enterprise that has ever been projected in Chicago has a better class of men behind it. The best men in Chicago have invested their money in it. It won't do to call them 'bandits' or 'fleecers' or 'thieves.' If these men want to stand it they can, but this corporation will not. We will stop it if there is law in Illinois to stop it. Many a business enterprise, and many a business man, has been ruined by Chicago newspapers. Millions of money have been driven away from this city by these newspapers, and every business man in this city will tell you so. So far as the corporations that I represent are concerned, we will not suffer it any longer. They can tell the truth. We do not fear that, but we are determined to put an end to reckless and malicious lying."

Dearborn, Mich., now claims to be a suburb of Detroit, the Detroit, Ypsilanti & Ann Arbor, the electric line now building, having been completed that far.

## UNDERGROUND CONDUIT ELECTRIC ROADS IN AMERICA.

None of the methods of electric traction have furnished a field with more attractions for the inventor than the underground conduit, and some hundreds of such systems, or, rather, portions of such systems, have been designed; many of these have been described in the periodicals of their respective times, a few have reached the dignity of a trial and subsequent abandonment, and fewer still have proved a practical success in operation.

The work now in progress on the lines of the Capital Traction Company, of Washington, makes this a fitting time to review the progress of electric conduit roads in this country.

Experiments have been made with both open and closed conduit systems, the latter known also as surface contact systems. Since less has been done with the closed conduits it is perhaps best to speak first of them. Abroad they have been several systems elaborated by Pollak, Lineff, Gordon and others; one of the most recent is that known as the Claret-Vuilleunier with seven miles of single track in operation in Paris; this last was described in the "Review" for July, 1897, and is notable as the only surface contact system described in the report of Birmingham Tramway Committee, which visited nearly all of the cities of Europe where electric traction is employed. In the United States the Wheless, the Van Depoele and the General Electric systems have attracted most attention.

Early in 1893 an experimental line on the Van Depoele system was laid at Coney Island by the American Engineering Company; two insulated cables were laid in a wooden conduit with contact boxes placed at intervals of 10 ft. along each, the two sets of boxes being staggered so that measured along the track the boxes were 5 ft. apart. Severe tests were made in order to show that the system would work successfully under all climatic conditions, and that it could not be short circuited by water.

The Wheless surface contact system was first applied to a section (about 3-4 mile long) of the Washington, Arlington & Falls Church Railway in Washington. It has also been in successful operation for several years at the works of the Westinghouse Electric & Manufacturing Company, which controls the system, at East Pittsburg, where the yard tracks are so equipped.

The General Electric Company within the last year perfected a surface contact system, and changed the tracks in the yards of the works at Schenectady from the overhead trolley for surface contact working. The Thomson-Houston Company is now engaged in laying this system over 3 miles of track at Monte Carlo.

The first electric system to operate in competition with horses was laid in Cleveland by Bentley & Knight, and the road, 2 miles long, was opened to the public in July, 1884. A slotted conduit made of wood was laid between the rails; this road was operated for about a year. In January, 1888, 1 mile of the Observation Hill Passenger Railway, in Allegheny City, was equipped with the Bentley-Knight conduit; about a year later 3 miles of conduit were laid in Boston on the West End road, and a portion of the North & East River Railroad in Fulton street, New York, was so equipped. The Bentley-Knight conduit in the later installations consisted of iron yokes supporting Z or Phoenix slot rails; to the yokes were bolted pieces of timber, to



which were attached bare conductors, one on each side of the conduit. All of these lines were abandoned after more or less lengthy trials, and some thought at the time that the last hope of being able to place bare wires in an open conduit had also disappeared.

Following these failures came the reports of the successful working, from a financial as well as from an electrical or a mechanical standpoint, of the now celebrated Budapest line installed by Siemens & Halske. This road is most interesting, because it is the "Modified Budapest" system that has been laid in this country. The conduit was of cement, oval in shape, 11 in. wide at the widest point and 13 in. deep. The two conductors were of angle irons supported on the sides of the conduit about 10 in. above the floor by insulators placed at short intervals. This road was first opened in January, 1889.

Among other conduit roads, most of them, only slight modifications of the Budapest, are two short lines in Brussels, one in Dresden about  $\frac{1}{2}$  mile in length, a line  $1\frac{3}{4}$  miles long in Berlin, and one comprising seven miles of single track laid in Madras, India, in 1895. In August, 1894, an air seal conduit (so-called because the conductors were hung under strips of inverted U section, so that in event of the conduit becoming flooded the water could not reach the conductors because of the air entrapped under the U-shaped guards) was laid near Berlin and reported to give satisfaction.

The conduit road at Blackpool, England, has but one conductor in the conduit, the rails being used for the return.

The two systems of open conduits that have been successfully operated in the United States are the Love and the General Electric. The Love Traction Company in 1892 by arrangement with the North Chicago Railroad laid a conduit  $1\frac{3}{4}$  miles long on the Fullerton avenue loop in Chicago which was operated intermittently from March 1, 1892, till the fall of 1894. This road was laid in mid-winter and in great haste, and a mistake was made in trying to economize in materials. Yokes were used which provided for a conduit 9x15 in.; bare No. 0000 copper wire was used. Difficulties in operation were experienced from two sources: There were four curves on the loop and the distance between the trolley wires and the yokes was but  $\frac{3}{4}$  in. on curves, so that the trolley wheel would come in contact with the yokes at these points. The trolley wires expanded in summer and caused trouble.

The next piece of conduit laid by the Love Company was on 12 miles of double track of the Rock Creek Railway in Washington. This was completed and in operation April 1, 1893. At the Street Railway Convention in that year M. D. Law, electrician of the Rock Creek Company, reported that the operation had been very satisfactory. During 1894 there were a number of interruptions, the greatest trouble being due to the expansion and contraction of the conductors, and that the insulation was not readily accessible.

In 1895 this company contracted to build for the Third Avenue Railroad Company, of New York, a section of underground conduit, nearly half a mile of double track, which was completed early in 1896.

The Metropolitan Railroad, of Washington, was forced by act of Congress in effect August 2, 1894, to change its lines to the underground conduit system, the time being limited to one year for the 9th street line and two years for

the F street line. The system adopted is that known as the "Modified Budapest", or the General Electric; the details were worked out by A. N. Connett, chief engineer of the Metropolitan Company. The two lines equipped aggregate 22 miles of single track. The conductors in this work differed from those used in the first conduit laid by the Metropolitan, New York, in being of T-section instead of channels.

In 1894 the Metropolitan Traction Company, New York, decided to equip its Lenox avenue line (8.62 miles measured as single track) for the underground conduit system, and the work was completed the following summer. The company did not have perfect confidence in the success of its experiment, and built the conduit as if it were to be used for a cable line, in order that a cable might be installed without loss of time if necessary. Two methods of supporting the conductors, which were of channel section, were used on different sections of the line, that of suspending them from insulators bolted to the slot rails, and that of setting them on soapstone pillars.

In the summer of 1897 the Metropolitan Company undertook to extend the system to nearly 60 miles (measured as single track) more of its lines. Work was commenced in August and at the present time is more than two-thirds finished. The operation of the Lenox avenue line having proved the electrical system to be satisfactory, the conduit was made smaller than in the former construction, the bottom of the interior being but 20 in. below the top of the rails. Rails of T-section were adopted and some minor changes made in the insulators and methods of supporting the conductors.

The Capital Traction Company, of Washington, after the destruction of its cable power house by fire on September 20, last, decided to adopt the conduit system, so that we may soon place the underground conduit mileage of the United States at more than 100 miles. This is a small amount in comparison with the total for street railways, but it demonstrates that the open conduit has won a place for itself as being preferable to the cable where the conditions would make a cable road a paying investment.

We do not look for the extension of the system outside of Washington and New York. In Washington the question of motive power was settled for the Metropolitan road by Congress. In New York the inability to secure frontage consents for the use of the trolley made it necessary, and the great traffic density made it possible, to lay either a cable or an electric conduit line; the superior advantages of electricity led to the adoption of the latter.

After the mechanical details of supporting the bare conductors properly had been worked out, the important problem was that of properly draining the conduit. The recent experience in Washington has been that while the flooding of the conduit does not shut down the line, when 150 ft. is flooded the power required to propel the cars is about doubled.

When J. B. Dyar obtained a franchise from the city of Port Huron, Mich., to build an electric railway he deposited a certified check for \$2,000 as a forfeit for not completing the road in the specified time. On account of financial difficulties the road could not be built, and Mr. Dyar asked for his check; the council at first refused, but later complied with his request.

## RELATIONS OF STREET RAILWAY AND MUNICIPAL CORPORATIONS.

History and Growth of Street Railways—Their Status in Public Highways—The Use of Highways by Them—The Question of Increased Cost of Maintenance of Roads—Ample Returns Made by Street Railways—They Can Carry No Greater Burdens.

BY EVERETT W. BURDETT.

As has been stated in these columns a special committee, consisting of Charles Francis Adams, William W. Crapo and Elihu B. Hayes, was appointed by the governor of Massachusetts under an act of the last legislature to investigate and report upon the relation of street railway and municipal corporations in Massachusetts, and has been hearing testimony and argument. On December 3, Everett W. Burdett, counsel for the Massachusetts Street Railway Association, closed the case for the street railways, in an able argument which, we regret to say, lack of space prevents us from giving in full. Below will be found that portion of Mr. Burdett's argument which deals with the topics of widest interest to street railway men outside of Massachusetts.

### I. History and Growth of Street Railways.

As a basis of our inquiries, it will be well to review briefly the history and present condition of the street railway industry itself.

Street railways are an American invention, and are said to have been first operated in the city of New York in 1825. The first car was run in Boston by the Cambridge Railroad Company in 1836, and in the fall of the same year the old Metropolitan Railroad began to run its cars between Roxbury and Boston. Both of these companies subsequently became parts of the existing West End system, and it is an interesting fact that both the Metropolitan and the West End roads have, successively, been the largest street railway corporations in the world. Today, I believe, the West End is exceeded in mileage and equipment by one road only—that in Philadelphia. But incidentally I may say that it appeared here the other day, as you will remember, that, whereas in Philadelphia the mileage exceeds that of the West End by about 33 per cent, its capital exceeds the capital of the West End by about 100 per cent.

The success of the street railway in New York, and of the Cambridge and the Metropolitan railways in Boston, was such as to lead to the application for many charters prior to the sixties. Some were operated and some were not. Difficulties were encountered, as, for example, in the case of the Cambridge Railroad, which found itself in the position of having its tracks torn up in the streets of Cambridge, and finally, when they came to equip the road, the original stockholders were unwilling to do it, and they had to organize another corporation and get fresh capital, which capital, as a matter of fact, furnished the cars which were first run from Cambridge into Boston. In this connection I may call your attention to a very interesting article, written by Prentiss Cummings, vice-president of the West End Company, entitled "The Street Railway System of Boston," published in the "Professional and Industrial History of Suffolk County," copies of which have been separately printed and can probably be obtained from Mr. Cummings.

The growth of this industry during three periods of 10 years each—that is, between 1866 and 1896 will be very strikingly shown by a table which I will now submit, from which the following facts, in brief, appear:

In 1866 the total mileage operated was 107; in 1896 it was 1,291. The car-miles run in 1866 were 4,952,248, and in 1896 they were 53,613,685. The capital stock and debt in 1866 were \$5,257,540, and in 1896 it was \$61,117,714. The gross receipts in 1866 were \$1,707,447, and in 1896 were \$14,900,941. From this it appears that 30 years ago the entire mileage of the street railways of Massachusetts was only about one-third of the present mileage of the West End system alone; that in 1876 that mileage had increased so that it represented about two-thirds of the present mileage of the West End system; that in 1886

TABLE A.

Growth of Industry in Last Thirty Years.

YEAR	Miles Operated.	Car Miles Run.	Capital Stock and Debt	Gross Receipts.
1866.....	107.82	4,952,248	\$5,257,540 00	\$1,707,447 35
1876.....	266.05	9,130,952	8,496,426 00	2,975,091 23
1886.....	407.64	19,661,675	14,590,374 00	5,878,583 05
1896.....	1,291.04	53,613,685	61,117,714 00	14,900,941 93

Capital stock of companies in Massachusetts Sept. 30, 1896, \$30,727,818  
 Net indebtedness (exclusive of capital stock) Sept. 30, 1896, 30,389,896

Total investment Sept. 30, 1896, \$61,117,714

that total mileage had grown so as to exceed the present mileage of the West End by about 25 per cent; while in 1896, the total mileage being about 1,300, the West End mileage constituted less than 25 per cent of the whole.

I have here another table, showing in detail the growth of this industry in the last 10 years. This table shows that the number of companies has increased in the last 10 years from 41 to 83; that the total investment has increased from about \$14,600,000 to over \$61,000,000; that the gross receipts have increased from less than \$6,000,000 to almost \$15,000,000; the car-miles run from less than 20,000,000 to nearly 54,000,000; the number of passengers carried from 112,000,000 to almost 300,000,000, the number of employes from 4,615 to 9,130, and the wages paid to employes from \$2,250,000 to an amount considerable in excess of \$4,000,000. This increase has been due principally to the introduction of electric traction.

Table B exhibits in detail the items of growth from 1886 to 1896, inclusive.

The first successful use of electricity in this Commonwealth was not, as has generally been supposed, by the West End Company, but by the Lynn & Boston Company. That company began to run cars by electricity in July, 1888; the West End, in February, 1889.

One of the curious facts connected with the sudden and wonderful development of electric traction in this Commonwealth is that in 1885, by chapter 337 of the Acts of that year, the Legislature, foreseeing the possible substitution of some motive power for horses, passed a law that companies might use cable as a motive power, but wholly ignored the possible use of electricity. In the West End Act of 1887 (chapter 413) that company was authorized to use cable and electric systems. The possibilities of electricity had at that time become sufficient to warrant the insertion of the word in the act; but the cable was really the motive power which the West End at that time intended and expected to use. In the early days of electric traction in this Commonwealth, the companies were generally incorporated by special acts, which gave them express authority to use electricity as a motive power. But, curiously enough, no general law has ever been passed authorizing the use of electricity as a motive power in place of any other. The companies depend today upon Public Statutes, chapter 113, section 39, which is to the effect that a street railway company "may use such power on its tracks" as the aldermen or selectmen may from time to time permit. Some doubt has been suggested as to whether this provision of law is broad enough to include the erection of poles and wires and the making of such surface and underground alterations as are necessary for the operation of the present modern electric railroad. But that question has



TABLE. B.  
Growth of Industry in Last Ten Years.

YEAR.	No. of Co's Organized.	No. of Co's Operating.	Construction and Equipment.	Total Investment.	Gross Receipts.	Miles Operated.	Car-Miles Run.	Passengers Carried.	No. of Em- ployees.	Wages Paid to Employees.
1886.....	41	40	\$10,577,627 60	\$14,590,374	\$5,878,583 05	407 64	19,661,675	112,087,384	4,615	\$2,257,584 71
1887.....	43	40	12,202,581 19	16,544,688	6,459,524 80	470.27	20,625,846	124,787,328	5,222	2,638,183 40
1888.....	44	38	12,933,255 08	18,464 101	6,860,504 32	533.59	23,244,767	134,478,319	5,531	2,688 730 85
1889.....	43	39	13,720,805 73	20,789,980	7,554 509 66	571 65	24,259,491	148,189,403	6,302	2,947,809 54
1890.....	44	42	17,142,670 13	25,611,989	8,388,015 48	612.38	26,516,937	164,873,846	6,246	3,149,710 81
1891.....	54	51	19,859,405 16	31,210,768	8,901,123 36	672.45	27,670,166	176,090,189	6,449	3,254,477 94
1892.....	59	54	26,067,957 79	38,794,814	9,817,537 35	749 95	29,617,975	193,760,783	7,157	3,353,096 30
1893.....	60	54	33,681,321 89	49,589,688	10,894,704 11	874.14	34,507,282	213,552,009	8,070	3,285,926 00
1894.....	68	54	35,552,503 36	53,020,295	11,236,428 32	930.47	36,722,978	220,464,099	7,451	3,216,638 24
1895.....	75	58	37,151,041 24	55,357,081	13,246,371 98	1087.17	43,655,560	259,794,308	8,048	3,607,881 42
1896.....	83	77	42,389,132 47	61,117,714	14,900,941 93	1291.04	53,613,685	292,358,943	9,130	4,143,379 74

become so well settled now by usage that I suppose nobody would undertake to question the sufficiency of the general law for that purpose; at any rate we do not suggest any change in it.

## II. Status of Street Railways in Public Highways.

Having traced the history of the street railway, let me next refer to the history of roads themselves; because the history of roads and streets, the nature and theory of their uses, and the law which underlies those uses, constitute the secret of this whole question.

Highways of some kind or other are as old as civilization itself, but have been of very different kinds and qualities in different times and countries. The Romans built some of their wonderful roads in England, but these were allowed to fall into decay, and for centuries together such things as good roads were unknown in England. Macaulay, in his History of England, in commenting upon the wretched condition of roads in the time of Charles II., and upon the unsatisfactory social conditions for which that fact was chiefly responsible, deliberately expressed the opinion that inventions which abridge distance are more important to civilization than any others, the alphabet and the printing press alone excepted. In the times to which he refers a "coach and six" were not matters of luxury or extravagance, but were absolutely necessary, owing to the condition of the roads. When, only about 200 years ago, carriages were invented which were capable of making the journey from Oxford to London in one full day, instead of two, as had theretofore been required, they were such wonders that they were dubbed "flying coaches." A short time ago I saw an original copy of an old advertisement of a line of coaches which proposed to start in April, 1706, and make the journey from York to London; which advertisement stated that the coach "will perform the whole journey in four days (if God permits), and sets forth at 5 in the morning." These antiquated schedules were not owing to the fact that they did not have good horses in England at that time, or that the art of coach-making had not advanced so that they could make vehicles which would stand the journeys, but to the wretched condition of the roads; and I am surprised to find, upon investigation, that the art of road-building in England is hardly more than one century old. In this country it is familiar knowledge, that, prior to the invention of the present form of bicycle, really good roads were unknown outside of a few of the principal cities and their immediate suburbs.

The Indian's trail through the primeval forests was the forerunner of the highway in this country. That was followed by the path blazed by the pioneer, which was scarcely more dis-

tinct than the Indian's trail had been. The pioneer was followed by the settler, who made paths for driving cattle and for horseback travel. Finally the colonist constructed rude highways for the use of carts and, finally, for the use of carriages.

Up to this time the only use of highways, in fact or law, was the use for travel. Lord Mansfield said in his day that the only right the king himself had in the highways was a right of passage for himself and for his subjects (1 Burrows, 143); and such has been the law since the time of Edward IV., at least (16 Mass. 34). But gradually, from necessity, as civilization became more complex and the demands of the public became more numerous, the uses of the roads were multiplied. In the case of *Boston v. Richardson*, 13 Allen, 146 (1866), the Court said: "The right of the public in a highway, even when so ancient that its origin is unknown, is ordinarily limited to an easement for the purpose of travel." But they added: "Whenever land is taken for public use as a highway, and due compensation made, the public, or those corporations or officers who act as trustees or agents of the public, have a right to make any use of the land, directly or incidentally conducive to the enjoyment of the public easement, and which the necessity or convenience of the public may require."

"And such uses clearly include (besides the use for travel) the making of culverts, drains, and sewers under the highway for the cleansing of the streets and the accommodation of the inhabitants on either side."

In a more recent case, which I will refer to again presently, that of *Pierce v. Drew*, 136 Mass. 75 (1883), Judge Devens said: "It has never been doubted that, by authority of the Legislature, highways might be used for gas or waterpipes, intended for the convenience of the citizens, although the gas or water was conducted thereunder by companies formed for that purpose."

Certain other uses of the highway, besides those for travel, have been regarded in some jurisdictions as "in aid of the easement," as it has been put; as, for example, the location and maintenance of poles or posts for the support of public lights to light the highways. That use has been said to be in aid of the easement, because it is one of the methods of promoting the safety of public travel.

The question finally arose whether the presence of horse-railroad tracks in the streets was a new use, imposing a new servitude. That question was determined in the case of *Attorney General v. Metropolitan Railroad*, 125 Mass. 515 (1878).

Inasmuch as this is one of the vital points in our discussion, you will pardon me if I read a paragraph from that decision. The Court says: "The franchise granted to a street-railway corporation is not the grant of a right to appropriate without



compensation an additional easement in the soil of the street. Nor can such use of the street, under proper restriction, be considered as the imposition of an additional servitude upon the land of the owner. The peculiar privilege given is the right, not to acquire land, or an easement in land, but only the right, so long as permitted by certain municipal authorities, to lay tracks in streets already appropriated to the use of public travel for the purpose of facilitating such travel; to modify the public use, and change, to some extent, the law of the road. Such a privilege, however wide the street in which it is exercised, must always create some obstruction to other travel, and be to some extent exclusive; and this is true of all other kinds of public travel. The location of a highway creates a servitude which includes all forms of travel not prohibited by law, with the right in the Legislature to give to municipal or other corporations, or to private individuals, the power reasonably to modify the use of the same for travel, as public convenience and necessity, in the application of modern improvements, may from time to time require."

A more difficult question subsequently arose, as to whether the location and maintenance of telegraph poles (and the same question, of course, is applicable to telephone poles) was consistent with the original use of the highway, or was a new use and imposed a new servitude. In other jurisdictions—in New York and Minnesota, perhaps elsewhere—this has been held to be a new use of the public highways; but in one of the most thoroughly discussed cases in our reports the contrary view has been taken by the Supreme Court of Massachusetts. It was a case where the selectmen of a town were about to grant a right to a telegraph company to erect poles in the public streets, and certain abutting land-owners brought proceedings to restrain their action, on the ground that this was a new use of the highway, for which the Legislature had provided no new compensation.

This was the case of *Pierce v. Drew*, 136 Mass. 75 (1885). The majority of the Court in that case said: "When the land was taken for a highway that which was taken was not merely the privilege of traveling over it in the then known vehicles, or of using it in the then known methods for either the conveyance of property or transmission of intelligence. . . . The discovery of the telegraph developed a new and valuable mode of communicating intelligence. Its use is certainly similar to if not identical with that public use of transmitting information for which the highway was originally taken, even if the means adopted are quite different from the postboy or the mailcoach. It is a new discovered method of exercising the old public easement."

Two able judges, however, took the contrary view. They regarded the analogy from the street railway to the postboy and the mailcoach as "a somewhat remote analogy;" but they distinctly agreed with the doctrine of *Attorney-General v. Metropolitan Railroad*, to the effect that the establishment of a horse-railroad track in highways did not impose a new servitude upon them, and say that that decision is "founded on just principles."

On the other side of the line are steam railroads, whether on the surface or in the air. The leading case with respect to steam roads is that of *Williams v. New York Central Railroad*, 16 N. Y. 97.

There it was held that the dedication of a street in Syracuse to public travel did not include, in anticipation, the use of it for a steam-railroad track. Anybody who has ever had the experience, as I have, of attempting to sleep in a hotel located on that street will readily agree with the view which the Court took of its uses for railroad purposes.

It has also been held in the State of New York that an elevated railroad, which occupies practically the whole street and a portion of the sidewalks with its tracks, and runs cars 11 ft. high, at high rates of speed, by means of steam locomotives, emitting smoke and cinders and dust and gas, and creating a great deal of noise and disturbance, and undermining the peace and comfort of all the people along the road, constitutes a new use of and imposes a new servitude upon a public street. The correctness of that view is recognized in our state, because the reason why the Boston Elevated Railway must use the Subway is because it will thereby avoid payment of enormous

damages to property, which would arise if the road was erected in the streets in the business section of the city.

But some people thought that the previous decision might not include the electric street railway. And so a bill in equity was brought to restrain the building of the West End road in certain streets in Cambridge. It is the case of *Howe v. The West End Street Railway Company*, 167 Mass. 46 (1896).

Inasmuch as this involves one of the precise issues which we are discussing, you will pardon me if I read a few words from the language of Chief Justice Field:

"The electric railway of the defendant as now constructed and used is something intermediate between the street horse railway and the ordinary steam railroad."

"It is obvious that the use made of a public way in the operation of an electric railway is of the same general kind as that for which the way was originally laid out, viz., the transportation of persons and things from place to place along the way. It is equally obvious that the actual operation of the electric railway shown in the present cases does not exclude ordinary travel from the way; that there is no exclusive occupation by the railway of any part of the surface of the way, and that the overhead structure is incidental to the use of the surface way, and does not prevent the public from using the way in the ordinary manner. . . . The whole system of street railways is founded on the theory that the use of the ways by the railways must be consistent with the use of the ways by other travellers at the same time."

So it is settled in Massachusetts, finally and deliberately, that the electric street railway, as it exists today, in its most aggravated form, as it might be termed, does not constitute a new use of the public highway or impose a new servitude upon it, but is entirely consistent with and similar to that for which the highway was originally dedicated.

It is well enough to remember that even the driving of cattle through the streets is a use which has been held to be consistent with the ordinary use of the highways. Originally, our highways were nothing but cattle-paths; and the right to drive cattle through these paths having been acquired in ancient days, the right remains in the streets of modern cities. I suppose a drove of cattle might be today driven through Washington street, in Boston, with impunity, unless some police regulation of the city might thus be violated.

In very recent times a new use of the highways, in the ordinary sense of the term, has grown up and become very important, namely, the use by bicycles. I have no fault to find with the modern bicycle; I am somewhat of a devotee to it myself; and yet of all the nuisances that exist on earth I sometimes think that the bicycle is the chief. It is, at times, practically exclusive of other uses of the highway. Every one who wants to use the highway for any other purpose knows this to his sorrow. And yet nobody has suggested that the people who make this aggravating and sometimes almost exclusive use of our highways are subjecting them to a peculiar use for which they ought to pay something in the form of extra taxes.

In New York they now have motor cabs; in Newport, and perhaps other places, they have motor carriages; the fire-engine propelled by steam is already with us; and other new (in the sense of unusual) uses of the highways are likely to develop rapidly.

Nobody would suggest that these new-comers should pay for the use of streets in the form of extra taxes. And yet nobody knows how far these new uses may be multiplied and developed.

The following may therefore be named as existing uses of highways which are regarded as within the classes of uses for which highways in Massachusetts have been dedicated; namely, the uses made of them by pedestrians, equestrians, carriages—public and private—express wagons, drays and carts of all descriptions, for moving merchandise, coal, iron, lumber, granite, furniture, etc., cattle, bicycles and tricycles, motor carriages, omnibuses, and street railways.

All these involve more or less wear and obstruction of highways, and more or less curtailment of other uses. But all uses must reconcile themselves to each other, and any use is tolerated which is consistent with the original purpose of the highway, and will promote the convenience of the public.

In addition to the use for travel, the following other uses may be mentioned as having been held to be incidental to the original purposes of the highway, and not imposing a new servitude: Underground pipes for drains, sewers, gas, water, electricity, steam, etc., and overhead poles and wires for telegraph, telephone, light and power lines, signal apparatus and other purposes.

*But the highest of all uses is that for travel.* None of these uses are specially taxed and none ought to be.

### III. Use of Highways by Street Railways No Reason for Special Taxation.

#### 1. THE NATURE OF THE USE.

It has been aptly said in this hearing that the street railway car is "the people's omnibus," a mere improvement of the old omnibus or stage-coach, running for purposes of convenience and of economy, along two rails laid on the surface of the road. I think I can safely venture the statement that all other methods of public travel in public highways put together do not promote the original purpose of highways as much as does the use to which the street railway car subjects them. It is, therefore, a natural use, a legal use, and it has come to be the most popular and the most beneficial use to which the streets can possibly be put.

To tax these conveyances—these people's omnibuses, which are making the most popular, the most useful, the most comprehensive, the most convenient, the most economical use of public highways—involves as a necessary corollary the taxation of the omnibus, the cart, the dray, the heavy team, and whatever other mode of travel subjects the highways to use and the communities in which the highways are located to expense. When you get to that result you have re-adopted the idea of the old toll road, where every "chariot" (as it was called on an ancient signboard which I saw a short time ago), and every cart and every horse and every sheep had to pay its way over the public roads.

I notice a significant shake of the head on the part of one of the members of this Committee. If I have not made this matter plain by reference to the history of roads, and by citations of decisions of our courts, I am fortunate in being able at this point to call attention to an opinion (which, by the way, I had not read until after I had formulated my own) given by a body of men who are perhaps better qualified than any others in Massachusetts to express an intelligent opinion upon this subject. If you will refer to the Railroad Commissioners' report for 1896, you will find on page 110 some significant language upon this point, which I would not have read except for the incident to which I have just referred. I am a little afraid that it might not otherwise be read by the Committee, and I will therefore take time to read it.

The Chairman:—My only thought was that it seemed to me you might go still further in your argument in the same line, without danger.

Mr. Burdett:—I have gone far enough for my purpose, Mr. Chairman.

The Chairman:—I thought you might go still further, that was all, sir, with perfect safety.

Mr. Burdett:—You will pardon me for reading an extremely well put and succinct argument upon this subject from the Railroad Commissioners' report:

"The railway is not to be regarded as an intruder, having no legitimate place or right to be on the public street. It is nothing more nor less than an improved method of public highway travel. The use of the highway by one method of travel necessarily interferes to a greater or less extent with the convenience and safety of its use by other methods. There are well-known inconveniences and dangers to other travellers attending the use of the highway by travellers in street cars. It must be conceded, however, that there is no known method of conveyance by which such large numbers of persons can be transported through the streets with so much convenience, expedition, and safety to themselves and other travellers, with so little noise, confusion, and dirt, and with so little obstruction and wear and tear of the street, as by the electric railway."

Nobody has ever accused the Massachusetts Railroad Commission, as now constituted, of being unduly prejudiced in favor

of electric street railways, and the language just quoted is the language of a quasi-judicial body, knowing all the facts. They continue:

"There are carried on the railways whose lines center in Boston, an average of 425,292 persons daily—a number equal to nearly 86 per cent of the entire population of the city. The great majority are carried through the most crowded thoroughfares. If it were possible to transport the same number of persons by any other available method of public or private conveyance, the obstruction, annoyance, and danger would on the whole be much greater than they now are."

That is a fact which people forget. No other method can be suggested by which so many people could be put through the streets of Boston without confusion if not chaos. They further say:

"It has been more or less seriously proposed to make the ordinary use of the surface of the street for railway purposes a source of revenue or relief to the municipal treasury, either by sale of the railway location, or by an excise on cars, or a tax on earnings, or by requiring the railway company to pave or otherwise maintain the surface of the entire roadway."

They recognize in this opinion, that paying is a tax, and I shall have occasion to refer to that a little later on.

"There is no reason why the railway company should not pay a tax on its corporate franchise and property such as other similar corporations pay. It is also proper that it construct at its own cost the tramway specially adapted to its use, and keep the portions of the roadway adjacent thereto in safe condition for other travel, as is now required by statute. These charges are a part of the cost of transportation which the passenger must expect to pay. Beyond this, it is not easy to see why one who carries passengers for hire in a car should be subjected to a tax for the use of the street, any more than one who carries passengers for hire in an omnibus, or who carries merchandise for hire on a dray. The radical objection to the proposed impost is not, however, that it is a burden on the railway company, but that it is a tax on the traveller. A tax on the carrier is a tax on the passenger. Whatever fare the railway passenger might otherwise have to pay, he must pay in addition to that fare his proportion of the tax; and the possibility of the reduction of his fare is to that extent postponed. Nothing has hitherto been more free than the use of the highway, for all persons, and for all purposes of travel or transportation. There is no good reason why the person who travels in a street car should pay, directly or indirectly, for the privilege of travelling on the highway, any more than the person who travels in a public coach or in his private carriage."

#### 2. THE REASON OF THE USE.

Why do street railway companies use the public streets? Is it a matter of choice with them? Is it a matter of preference on their part? Not at all. The highways are used by street railways as a matter of necessity, to meet the public demand for that exact use of the highways; and it is largely from the fact that the steam railroad is located at a distance from the regular lines of travel, and, unlike the electric road, does not land its passengers at the doors of their offices and their houses, that this other use of the highway is required by the public. I am inclined to think, from such examination of the figures as I have been able to make, that if the street railways might be permitted outside of the large cities, where, of course, it would be impracticable to go upon private land and buy their way and own their road-bed, and exclude from that road-bed all other forms of travel, they would be financially better off than they are to-day. But the curious fact is, as I understand it, that under the present laws of Massachusetts, a street railway corporation goes outside of the terms of its corporate franchise when it buys a piece of land and constructs its road over it. I know of a case now where a railroad company is desirous of buying and using land along the side of the highway, but is unable to do so because the laws of Massachusetts are not sufficient for that purpose. What sense is there in talking about a special tax upon an industry which uses the highway in promotion of the principal uses of the highway, and uses it because the public demands that that particular use shall be made of it?



### 3. THE CHARACTER OF THE USE.

A single word as to the peculiar character of the use. That use is monopolistic, confessedly monopolistic; but it is necessarily monopolistic and preferably monopolistic. And no person with correct ideas upon these questions would for a moment suggest that it ought to be anything but monopolistic. The impracticability and inadvisability of the operation of two street railway lines through the same streets is too apparent for argument. Companies consolidated into large and important corporations, under the regulation, as they are, of State boards of the strictest control, operating in streets to the exclusion of other companies of the same kind in the same streets or in the same towns and cities, give the public better service and better satisfaction in every way than competing companies could do.

### IV. Do Street Railways Increase the Cost of Maintenance of Roads?

If I have succeeded at all to this point, I have demonstrated that neither in law nor logic is there reason for the suggestion that this particular class of corporations ought to be subjected to any peculiar excise for the use which it makes, in common with other users, of the public highways. But underlying the other argument—and this I believe to be the only premise which can be safely assumed by the other side—is the proposition that, admitting there is no just ground in law or logic for the special taxation of these corporations for their use of public ways, yet that they subject these ways to a peculiar and extraordinary expense, and ought to be required to pay something in the nature of reimbursement for that expense. I think I have not heard it put just that way, but that is the most favorable way of putting it for the other side. We have heard a great deal said about charging rentals for the use of the public highways, which is a ridiculous proposition, inasmuch as there is nothing to rent. There is no title in the street, as we shall presently see, in the municipalities which control them. We have heard a good deal said about taxes and excises, but not much about reimbursement, which, as I say, would be the strongest statement of the case.

Assuming the claim of extra expense to be true, that is no reason for the imposition of special taxes, because all forms of use of public highways for purposes of travel involve some expense to the municipalities in which the highways exist; and it is therefore only a question of degree whether this, that, or the other use subjects the town in which the highway is to more or less expense. As soon as you begin to impose taxation because the degree of use in one case is greater than in another, you lose sight of all general principles, and are adrift. So that, if you assume the fact to be that the use of highways by street cars subjects those highways to extra cost, that in itself constitutes no reason for special taxation of the company which operates the cars.

But what is the fact about it? Do or do not street railways subject highways to a use which involves additional expenses upon municipalities? I shall not discuss the evidence which has been put in upon that point. You have heard some evidence upon it,—good, bad, and indifferent,—some very loose statements, and some more accurate statements. The principal witnesses may be said to be the superintendents of streets of Brookline and Springfield, on the one side, and an ex-mayor of Springfield and an ex-superintendent of public works of New Bedford, on the other. The Brookline official did not undertake to give any figures, but simply gave his impressions from observation, that in macadamized roads the extra cost of maintenance is a good deal, according to the width of the road. The Springfield official published a paper (which I had reprinted for the information of those concerned), in which he undertook to give some statistics; but it turned out that in the entire list of streets which he named there are but two where there are any street railway tracks and those are practically continuous.

Mr. Drake, of New Bedford, after a very careful and exhaustive study of the well-kept books of the street department of that city, showed that that city, at any rate, has been subjected to a larger expense for streets that are not encumbered by tracks than for those that are. The explanation seems to be that, in some cases, ordinary travel avoids the streets where the tracks

are; but upon the whole, his evidence tended strongly to show that it is at least doubtful, all things considered and all places taken together, whether the presence of tracks in any but the narrowest roads really subjects the other portions of the road to such a great deal of additional wear as has been claimed. In the case of streets that are paved from curb to curb, I believe nobody pretends that there is any great difference in expense; nor do they pretend that there is any great difference of expense where the railways are laid along one side of the public road, as is usually the case in the rural sections of the State; but it is only where the tracks are put in the middle of a macadamized street, not sufficiently wide outside of the tracks themselves to accommodate the travel, that this extra expense is incurred to any great extent.

I think, Mr. Chairman, that an intimation dropped by you at the first hearing is one which may well be borne in mind in the discussion of this question. The intimation was, as I understood it, that the art of road-building in the United States, even in Massachusetts, has hardly begun to be developed. In comparison with the state of the art in Europe. While you found there street railway accommodations which cannot for a moment be compared with those in Massachusetts, you also found such roadways that the presence in them of the street railway tracks constituted, practically, no obstruction to other travel. Let our municipal road-builders give us better roads, as they ought to do and will do in time, and much of the complaint against the car tracks will disappear.

### V. If Street Railways Increase Cost of Road Maintenance They Make Ample Returns Therefor

But assuming, if you will, that, all things considered, these companies do subject the municipalities in which they operate to larger expenses for road maintenance than would otherwise be the case, and that that is a sufficient reason for subjecting them to extra taxation, I announce, without any hesitation, that the companies make ample and sufficient returns therefor.

#### I. DIRECT TAXATION.

In the first place, they make returns in the form of direct taxation. They pay local taxes upon all their real estate and machinery, and they pay to the Commonwealth a franchise tax upon the full value of their shares, after deducting the valuation of their machinery and real estate. (Public Statutes, ch. 13, § 39.) I have here a table showing the growth of taxes upon these companies for the last 10 years. The result of it is, that while the increase in the number of companies has been 100 per cent, the increase in the total taxes paid by them has been 298

**TABLE C.**  
**Taxes Paid, 1886-1896.**

YEAR.	Total Taxes.	Average per Co.	No. of Co's Paying Taxes.	Taxes per Passenger.	Taxes and Interest per Passenger.
1886 ....	\$131,356 15	\$4,529 52	29	\$0.00117	\$0.00212
1887 ....	196,311 66	5,948 83	33		
1888 ....	190,474 74	5,952 33	32		
1889 ....	227,123 24	7,326 55	31		
1890 ....	284,979 33	7,916 09	36		
1891 ....	324,106 79	7,537 36	43		
1892 ....	404,721 22	9,636 24	42		
1893 ....	455,339 94	10,841 42	42		
1894 ....	418,999 37	9,976 17	42		
1895 ....	488,138 01	9,571 33	51		
1896 ....	523,346 19	9,023 21	58	0.00179	0.00389

1886-1896: Increase in number of companies, 100 per cent.  
 Increase in total tax, 298 per cent.  
 Increase of taxes per passenger, 52½ per cent.  
 Increase of taxes and interest per passenger, 83½ per cent.

per cent. You may say that does not prove anything, inasmuch as the increase in the number of companies may not represent the actual increase in the investment. That is true, but the table contains other figures, which show that the companies pay, proportionately, in the form of taxes, much more than they did 10 years ago. The increase in taxes paid by the companies per passenger carried—which is a proper unit—was 52½ per cent in the last 10 years. When interest on funded and unfunded debt is taken into consideration, as well as taxes, the charge or expense per passenger carried has increased to the enormous extent of 83½ per cent in the last 10 years.

The gentleman who represented before this Committee the Citizens' Association of Boston, found fault, as he always does, with the fact, as he claims it to be, that a street railway pays no more taxes than a bank or a mill situated in the same town or city. In the first place, it ought not to pay any more; it ought to pay nothing but proportional taxes. In the second place, it does pay more if it has more to pay upon. Why? Because that which gives value to the franchise of a street railway company is the presence of its tracks in the public streets; and so far as tracks make the stock of the company valuable, so far that value enters into the franchise tax which is assessed by the Commonwealth upon the aggregate value of the property and franchise of the company. A bank has nothing in the public streets. A mill has nothing in them. But so far as the tracks of a street railway company constitute an element of value, just so far that element of value enters into the tax which the Commonwealth assesses. Therefore, the street railway company does pay more than the mill or the bank, which has nothing of the sort to pay upon.

## 2. INDIRECT TAXATION.

In the second place, these companies make a still larger contribution to the public in the form of what I call indirect taxation. The items of paving, both original and renewals, road widening and grading, bridge strengthening and building, removal of snow and ice, accommodation of public authorities in the construction, removal, and repair of pipes and sewers of all descriptions, constitute these taxes. From returns which I have recently received from some of the companies, I have taken the paving expenses of five companies at random, outside of Boston. These companies were organized at various times; some are old and some are comparatively new. But they have together invested the sum of \$1,120,722 in pavements alone. The items are: Round paving, \$224,575; block paving, \$890,745; other paving, \$5,402. Some of the figures are estimated and some are exact. If the Committee wishes, I will furnish it with all figures on this subject which I have succeeded in collecting. The assertion has been made in this State House more than once, and has not been contradicted, that the West End Street Railway Company has at least \$2,000,000 of its capital invested in pavements in the streets of Boston and the surrounding towns and cities. I give these items merely to show the enormous aggregate that that charge becomes in the course of years. They have been accumulating a good many years in some cases, so that the charge per annum might not be regarded as very large. I do not want to be understood as saying or admitting that the annual expense for paving in Massachusetts—taking all the companies together—is equivalent in amount to any of the new taxes which have been suggested. I only say that the aggregate investment in paving has become very large in the course of years.

I do not need to discuss the testimony which has been given here as to the amount of these indirect taxes in other forms; but I beg you to bear in mind what different gentlemen have said as to how they have been called upon to widen highways, without expense to the communities in which they are located; how they have re-graded highways in many cases; how they have made boulevards out of cart-paths; how they have strengthened and, in some cases, built bridges; and how they have in various other ways made substantial money payments to or for the benefit of the public, in consideration of the privileges which have been granted them. In some cases, for example, they have paid astonishingly large amounts, not counting inconvenience and loss of traffic, in accommodating themselves to public works, such as the laying, repairing, and moving of sewers and water-pipes and things of that description. If you think it material to

go into an investigation of this item, you will find that these companies return to the communities in this form very considerable amounts, for which they should be credited.

## 3. CONTRIBUTIONS TO THE PUBLIC.

But perhaps more important than anything that I have yet mentioned are the contributions which the companies make to the public in another form. Take the matter of the increase of valuations. I will not inflict upon you statistics on that point. They are difficult to gather, and must be taken with a grain of salt. There has of course been a natural growth of population and of valuation in Massachusetts; but the growth in valuation has undoubtedly been very much promoted and accentuated and accelerated by the opening of the lines of street railway companies. In the case of the same five companies to which I have before referred, the increase in valuations in the towns and cities where they operate, since the adoption of electricity, has been \$51,839,818, and the average yearly increase since the adoption of electricity has been \$10,793,243. And the testimony shows that very much of this is directly due to the introduction and development of electric traction.

Mr. Storey, a gentleman who unselfishly devotes a portion of his time and thought to the consideration of public questions, made the astonishing statement here, that, in his opinion, the town of Brookline is no better off than it was before the advent of the electric railway, because, as I understand him, the taxes are no less than they used to be. And yet I was interested to find that the municipal expenditures of Brookline in 1886 were \$303,863, and that those expenditures had increased in 1896 to the sum \$955,949—an increase of 58 per cent without the increase of a single foot of territory. Brookline, making this expenditure in 1896 as against the smaller one in 1886, without any increase of territory, seems to me to be much better off than it was before. There has been an increase in population in that time almost exactly proportionate to the increase in municipal expenditures; but that increase in population has been largely brought about by the introduction of the electric railroad. The people who have moved in have brought money with them, have

TABLE D.

Differences in Fares and Transportation Facilities before and after Introduction of Electric Traction.

From	To	Railroad or Other Vehicle Fare.	No. of Trains or Vehicle Trips.	Street Railway Fare.	No. of Street Railway Trips.
Lowell	Tyngsboro'	<i>Cts.</i> .17	4	<i>Cts.</i> .10	34
"	No. Chelmsford	.09	6	.05	53
"	Chelmsford Centre	.09	3	.05	38
"	Wamesit	.08	14	.05	69
"	Tewksbury	.14	15	.05	<i>D</i>
"	No. Billerica	.11	12	.05	34
"	Billerica Centre	.15	4	.10	32
Worcester	Leicester	.25 <i>B</i>	2 <i>B</i>	.10	50
"	Spencer	.50	—	.20	—
Haverhill	Merrimack	.35	4	.10	40
"	Amesbury	.65	4 <i>C</i>	.20	40
So. Framingham	Milford	.27	—	.15	—
Medway	Milford	.30	4 <i>C</i>	.10	16
Gloucester <i>A</i>	Rockport <i>A</i>	.10	10	.05	½ hr.
"	Pigeon Cove	.25 <i>B</i>	—	.10	—

*A.*—Railroad depot three-quarter mile from the populous part of the city. Street railway through main streets.

*B.*—Stage.

*C.*—With change of cars.

*D.*—Line not yet started.

The street railway companies furnishing these accommodations have paid dividends of from 4½ to 6 per cent.



bought property, have improved it, and thus have added to the municipal valuation. All things considered, that community of 16,000 people to-day enjoys much better accommodations and conveniences, and is far richer and better off, than the community of 10,000 people in 1886.

But I think I would be willing to place over and above all the things which I have mentioned the enormous contribution to the public which has been made by the companies in the form of increased facilities. You will remember particularly the testimony of W. B. Ferguson, who has probably had an experience as large as, if not larger than, that of anybody else in this State, in the exploitation and management of suburban or country roads. Some of the figures which he gave, off-hand, without a note, were most astonishing in their character. P. F. Sullivan, of Lowell, unquestionably the ablest statistician in this business, gave to you a statement of the facts with respect to Lowell and the towns and cities adjacent to that city. I have compiled a table from the stenographic report of the testimony of Mr. Ferguson and Mr. Sullivan, which is very interesting and instructing upon this point, and which I will now submit.

Take Lowell, for example. In old times the fare between Lowell and Tyngsboro, on the railroad or the stage-coach, I don't know which, was 17 cents, and there were 4 trips a day; today the people travel between the same places for 10 cents, and have 34 trips a day. In old times the fare from Lowell to North Chelmsford was 9 cents, with 6 trains a day; now it is 5 cents, with 53 trips a day. Take some of the other cases: The fare from Worcester to Leicester by stage, before the advent of the electric railway, was 25 cents, and the stage made 2 trips a day; people can now go for 10 cents 50 times a day between those places. Between Haverhill and Amesbury the old fare was 65 cents, with 4 trips and a change of cars; today the electric railroad takes the people between those points for 20 cents and gives them 40 trips a day.

One of the most marked cases which was testified to was that of the route between South Framingham and Milford or Hopdale. In old times—or, rather, in very recent times—one had to leave Boston not later than 5 o'clock to connect at South Framingham with a branch railroad, in order to get to Milford the same night, and at an expense of 27 cents for the transportation. Now one can leave Boston at any time prior to 9 o'clock, and on Saturdays 11 o'clock, in the evening, and can connect with the street railway at South Framingham, and get home the same night, for 15 cents.

Between Medway and Milford—and that was a case, I remember, where the testimony showed that the entire highway was rebuilt by the electric railroad—the old fare was 30 cents, with 4 trips a day and a change of cars; whereas now the fare is 10 cents, with 16 trips a day.

And the roads giving those facilities to the public have paid only small dividends to their stockholders, without accumulating surpluses or making proper charges for depreciation.

You will also recall the testimony of N. Sumner Myrick—a professional gentleman, connected with several roads in suburban or country districts. He told you how, in some cases, the district schools in the outlying portions of country towns had been discontinued and the children transported by the electric cars to the village schools and given the privileges of a better education; and how the farmers and the people who go to sewing circles and to prayer meetings, and to other social and religious gatherings, nowadays go by electricity, rather than behind the old nag or on foot as they used to do.

In short, these roomy, clean, safe, attractive, well-lighted, well-heated, easily propelled omnibuses are not only carrying our people from door to door, but from town to town; are not only promoting social intercourse and furnishing additional facilities for healthful and reasonable recreation, but are increasing the values of the property, and facilitating the transaction of the business of our people; are transporting them more comfortably, more quickly, more cheaply, and more satisfactorily than ever before; and in many other respects are adding daily and yearly to the convenience and happiness of our

## VI. The Companies Cannot Carry Greater Burdens.

But whatever may be the truth with respect to the issues which I have so far discussed, I maintain that the street railway companies of Massachusetts today cannot bear any heavier bur-

den than they now carry. Corporate bankruptcy, reduced wages, or diminished facilities are inevitable, if any great raid is to be made upon their finances in the shape of extra taxes. Right here lies a fundamental difficulty in the public mind. Owing to the enormous increase in mileage and in the number of passengers carried and in the amount of the gross receipts of these corporations, the public has jumped to the conclusion that the business of electric railroading is nothing short of a Klondike bonanza. But quite the contrary is the fact. I suppose the average man who pays his 5 cents in a railway car in Boston thinks that he is making the West End a present of a large amount of money; but, in fact, the labor alone employed on the West End road takes nearly one-half of the 5-cent fare, and when the other expenses are paid, the stockholder gets only about *three-fifths of one cent* as his share of that fare. The fact is: *The introduction of electric traction has not increased the net results of operation.*

In the last 10 years, during which these roads have grown up, while the number of companies and the mileage and the gross receipts have increased as I have already stated, and while the aggregate dividends have increased from less than half a million to almost two million dollars, the rate of dividend has hardly increased at all, and it remains today at the very low figure of 5.87 per cent of the total capital invested. The following table gives the figures for the last 10 years:

**TABLE E.**  
*Dividends, 1886-1896.*

Year.	No. of Co's. Operating.	No. of Co's. Paying Dividends.	No. of Co's. not Paying Dividends.	Total Dividend.	Highest Rate, Per cent.	Lowest Rate, Per cent.	Average Dividend Rate for All Co's., Per Cent.	Average Dividend Rate for Co's. Paying, Per Cent.
1886	40	22	21	\$494,070 00	12A	2	5.41	6.73
1887	40	25	19	530,920 00	13	2.5	5.26	6.29
1888	38	21	25	625,616 67	10	3	5.74	6.72
1889	39	21	25	838,649 00	10B	2	6.82	7.61
1890	42	25	23	965,154 00	10	1	6.47	7.15
1891	51	22	34	1,100,015 00	10	3	5.63	6.44
1892	54	21	39	1,582,696 50	10	3	6.72	7.81
1893	54	25	35	1,716,637 50	10	1.5	6.63	8.22
1894	54	30	38	1,610,886 00	10.5	1	5.97	7.00
1895	58	33	42	1,606,196 00	9	2	5.76	6.63
1896	77	43	40	1,802,847 00	10.5	1.25	5.87	6.82

A. — One company (Naumkeag), with capital of \$150,000, paid special dividend of 22 per cent. on \$70,000.

B. — One company (Merrimac Valley) paid 42½ per cent. on \$80,000.

The Railroad Commissioners' Report for 1897 shows that of the 77 active companies 34 paid no dividends and 43 paid dividends ranging from 1¼ to 10½ per cent.

The number of companies paying dividends within these limits is interesting and instructive in this connection. For the year ending September 30, 1896 (the date of the last returns), the companies paid dividends as follows:

34 companies paid dividends of.....	0	per cent.
1 company paid dividends of.....	1 25	"
1 company paid dividends of.....	2 5	"
1 company paid dividends of.....	2 15	"
2 companies paid dividends of.....	3	"
3 companies paid dividends of.....	4	"
2 companies paid dividends of.....	5	"
12 companies paid dividends of.....	6	"
1 company paid dividends of.....	6 5	"
2 companies paid dividends of.....	7	"
9 companies paid dividends of.....	8	"
1 company paid dividends of.....	9	"
1 company paid dividends of.....	9 5	"
1 company paid dividends of.....	10	"
1 company paid dividends of.....	10 5	"

In the above table the West End company is put down twice, as it paid 7 per cent on common stock and 8 per cent on preferred stock.

The company credited with paying the highest dividend, 10.5 per cent, in fact paid 8 per cent on \$100,000, and 2.5 per cent on \$300,000.

One company credited with paying 8 per cent paid 5 per cent on \$50,000, and 3 per cent on \$90,000.

One company credited with paying 6.5 per cent paid 3 per cent on \$125,000, and 3.5 per cent on \$187,500.

The following companies paid the dividends put down against them upon less than their full capital stock:

One company paid 8 per cent on \$250,000 only, out of \$400,000.

One company paid 7 per cent on \$300,000 only, out of \$400,400.

One company paid 6 per cent on \$600,000 only, out of \$800,000.

One company paid 6 per cent on \$400,000 only, out of \$600,000.

But when we come to examine the net earnings and the surplus accounts of these corporations, and try to find the surplus profits which they have accumulated over and above the payment of very moderate dividends, we have some surprising figures to deal with. In 1886 the net surplus was \$1,453,602; in 1896 that surplus had fallen, notwithstanding the enormous increase in business and capital, to \$510,609. The percentage of that surplus to the capital invested had fallen during that 10 years from 15.01 per cent to 1.66 per cent—almost the disappearing point. If you will consult the next table you will find that it has been since the introduction of electricity that these drops have become most positive and most startling.

**TABLE F.**  
**Net Earnings and Surplus.**

YEAR.	Net Earnings.	Surplus.	Per Cent. of Net Receipts to Gross Receipts.	Per Cent. of Surplus to Capital Stock.
1886.....	\$1,026,774 90	\$1,453,602 92	17.46	15.01
1887.....	919,160 73	1,402,900 83	14.22	13.89
1888.....	1,096,852 79	1,111,490 72	15.86	6.82
1889.....	1,372,690 42	723,764 92	18.10	5.91
1890.....	1,813,942 56	740,319 88	21.62	4.74
1891.....	1,778,830 01	607,983 68	19.98	2.90
1892.....	2,356,312 40	950,771 35	24.00	3.55
1893.....	1,993,399 62	673,526 47	18.29	2.09
1894.....	1,812,668 30	760,687 78	16.13	2.30
1895.....	2,257,355 40	681,048 58	17.04	3.06
1896.....	2,280,775 71	510,609 51	15.30	1.66

**TABLE G.**  
**Average Investment per Mile of Track.**

YEAR.	Amount.	YEAR.	Amount.
1886.....	\$32,660 61	1892.....	\$46,215 54
1887.....	32,670 22	1893.....	53,367 28
1888.....	32,303 80	1894.....	52,963 10
1889.....	33,887 73	1895.....	49,120 00
1890.....	38,279 58	1896.....	46,372 66
1891.....	40,917 56		

The difference between 1886 and 1887, as you will observe, was scarcely more than 1 per cent. But in 1890 it was only 4.74 per cent; 1895, 3.06 per cent, and now it is down to 1.66 per cent.

The percentage of net receipts to total income, which is another test of the solvency and success of corporations, has also fallen during this period, although in not so marked a degree as the surplus to which I have referred,

During this same period the average investment per mile of track has increased \$13,712.05, or 42 per cent.

Let us apply another test by the use of a table showing the density of traffic during the last 10 years. The average number of persons carried per mile of main track operated in 1886 was

**TABLE I.**  
**Net Earnings, 1886-1896.**

YEAR.	No. of Co's.	Average Net Earnings per Mile Operated.	Average Net Earnings per Car-Mile Run.
1886.....	29	\$2,350 57	.0522 cts.
1887.....	32	1,868 22	.0446
1888.....	26	1,990 69	.0472
1889.....	29	2,360 60	.0566
1890.....	31	2,911 62	.0684
1891.....	32	2,639 21	.0643
1892.....	33	3,112 70	.0796
1893.....	34	3,218 18	.0835
1894.....	42	3,644 16	.0923
1895.....	49	3,767 80	.0938
1896.....	66	3,315 85	.0799

274,961, and in 1896 it had fallen to 226,453, or, excluding the West End, it had fallen from 150,647 per mile of main track operated to 121,396. That is to say, although the number of passengers carried, taking the whole state into consideration, had increased 60 per cent during that 10 years, the density of traffic per mile of main track operated had decreased 17.64 per cent, or, leaving out the West End, the traffic had increased 384 per cent and the density of traffic had decreased 19.42 per cent.

During those 10 years, the average net earnings per mile operated had increased from \$2,350.57 to \$3,315.85, and the average net earnings per car-mile run, from .0522 cents to .0799 cents.

Referring back to Table B, we find that there has been an increase in total investment of 318 per cent, while from Table I we see that there has been an increase in net earnings per mile operated of only 41 per cent and an increase per car-mile run of only 53 per cent.

Here is a still more striking and discouraging table. Between 1886 and 1896, while the number of miles operated has increased

**TABLE J.**  
**Total and Average Gross Receipts.**

YEAR.	Miles Operated.	Gross Receipts.	Average Gross Receipts per Mile Operated.	Car-Miles Run.	Average Gross Receipts per Car-Mile Run.
1886.....	407 64	\$5,878,583 05	\$14,421 01	19,661,675	\$0 2948
1887.....	470.27	6,459,524 80	13,735 77	20,625,846	0.3131
1888.....	533.59	6,860,504 32	12,857 25	23,244,767	0.2822
1889.....	571.65	7,554,509 06	13,215 26	24,259,491	0.3114
1890.....	612.38	8,388,015 48	13,697 40	26,516,937	0.3170
1891.....	672.45	8,901,123 36	13,236 82	27,670,166	0.3216
1892.....	749.95	9,817,537 35	13,090 92	29,617,975	0.3311
1893.....	874.14	10,894,704 11	12,463 11	34,507,282	0.3157
1894.....	930.47	11,236,428 32	12,076 07	36,722,978	0.3059
1895.....	1,087.17	13,246,371 98	12,184 26	43,655,560	0.3034
1896.....	1,291.04	14,900,941 93	11,541 81	53,613,685	0.2779

Increase in miles operated, 216 per cent.  
 " " gross receipts, 153 " "  
 " " car-miles run, 172 " "  
 Decrease in average gross receipts per mile operated, 20 per cent.  
 " " " " " " " car-mile run, 57 " "



**TABLE H. Density of Traffic.**

IN WHOLE STATE, INCLUDING BOSTON.				IN STATE, LEAVING OUT TERRITORY COVERED BY WEST END SYSTEM.			
YEAR.	No. of Miles Main Track Operated.	No. Passengers Carried.	Average No. Carried per Mile of Main Track Operated.	YEAR.	No. of Miles Main Track Operated.	No. Passengers Carried.	Average No. Carried per Mile of Main Track Operated.
1886.....	407,649	112,087,384	274,961	1886.....	171,531	25,840,604	150,647
1887.....	470,271	124,787,328	265,352	1887.....	242,195	32,631,812	134,733
1888.....	533,593	134,478,319	252,024	1888.....	255,691	36,452,875	142,566
1889.....	571,654	148,189,403	259,230	1889.....	324,272	42,683,214	131,628
1890.....	612,384	164,873,846	269,233	1890.....	364,262	48,576,105	133,355
1891.....	672,452	176,090,189	261,565	1891.....	421,140	55,237,875	131,163
1892.....	749,953	193,760,783	258,364	1892.....	495,181	65,699,735	132,660
1893.....	874,144	213,552,009	244,579	1893.....	615,001	78,706,365	127,978
1894.....	930,473	220,464,099	237,353	1894.....	685,693	83,435,650	121,681
1895.....	1,087,175	259,794,308	238,963	1895.....	848,931	104,562,802	123,300
1896.....	1,291,040	292,358,943 <small>(Increase of 100% over 1886.)</small>	226,453	1896.....	1,033,762	125,496,655 <small>(Increase of 180% over 1886.)</small>	121,396
Total decrease, 1896 over 1886.....			48,508 or 17.64%	Total decrease, 1896 over 1886.....			29,251 or 19.42%

## THE STANDARD SYSTEM OF ACCOUNTS.

216 per cent, and the gross receipts have increased 153 per cent, and the car-miles run have increased 172 per cent, the average gross receipts per mile operated, which is the proper unit, have decreased 20 per cent, and the average gross receipts per car-mile run have decreased 57 per cent.

Referring to the aggregate surplus shown by the returns of 1894-5, which was only \$234,304 for the entire street railways of Massachusetts, the Railroad Commissioners very aptly say that this is "close figuring," considering the amount of capital invested and business done. (R. R. Comms. Rep. 1896, p. 106.) And during all this time, while the surpluses of the companies have been diminishing, there have been practically no charges for depreciation.

I beg to call your particular attention in this connection to the Railroad Commissioners' Report of 1896, page 106. Discussing this question of whether or not the roads have increased in prosperity since the introduction of electricity, they say:

"The inference from the foregoing statement might naturally be, that the street railway companies are largely adding to their net revenues from year to year, and earning if not paying more liberal dividends, or piling up a more abundant surplus. A closer and more careful scrutiny into the results and present conditions of street railway service does not sustain this conclusion."

Then they go on to discuss all the elements, which I should like to read, if I did not think it was an imposition to do so, giving the comparative results of street railway operations between 1885 and 1895, and say:

"The truth appears to be that the electric railway is not on the whole earnings so large a net percentage on the capital invested, or paying so large a dividend to the stockholders, as did its predecessor, the horse railway; and this will be found to be as true with respect to the city as the country railways, taken as a class."

They then proceed to discuss the figures (pages 108 and 109), which will be found interesting and instructive, and conclude as follows (p. 110):

"It is not by any means intended to convey the impression that electric railway operation is, or is destined to be a financial failure. The idea that it is likely to prove a source of extraordinary or abnormal profit must, however, be abandoned. It is a close business, yielding with skillful and prudent management only a fair average return, quite within the limit allowed by statute and conservative opinion as adequate and proper for investments of this character."

The most important work undertaken by the Accountants' Association was standardization of street railway accounts. An excellent report was submitted at the October convention by the committee having the subject in hand, and afterwards that committee was made a permanent one, it being understood that one of its chief aims would be to secure the adoption of the system. The members of the committee believe that they personally should practice what they preach; Mr. Duffy, secretary of the National Railway Company's roads, St. Louis, and Mr. Calderwood, secretary and auditor of the Twin City Rapid Transit Company, Minneapolis and St. Paul, put the new standard system of accounts in operation on January 1, so that the system will receive a thorough, practical test, and a basis for the interchange of information and comparisons between at least two companies is afforded, if such be desired.

Mr. Duffy advises us as to the details of the change as follows:

"The 39 operating expense accounts, as recommended, I condense into 16 ledger accounts carried on the ledger, the number of ledger accounts I have always used, and 169 items are carried on a 'Distribution of Operating Expenses Book', for the purpose of showing full and complete detailed and statistical information, as has always been my practice. I have found it entirely practical and comparatively easy to adapt my system of accounts to conform with the system recommended by the Accountants' Association to the permanent committee. The system can be conformed to without disturbing any system now in use, without discarding the ruled account books, and without any expense further than the cost of the necessary printed instructions and a 'Distribution of Expenses Book'. It is not necessary to change the ledger accounts, thereby rendering a comparison of the operations of a road in 1898 valueless and impossible, as compared with 1897; at least,

WORK ON THE CAPITAL TRACTION,  
WASHINGTON.

I did not find it necessary. These would be the main reasons why objections would be raised to adopting and using any standard system recommended by the Association. Any additions or changes that may finally be made by the permanent committee, I can easily conform to by pursuing the same method as the one I have just made use of."

Since writing the foregoing we learn that Mr. Duffy has received letters from three of the St. Louis roads, which are as follows:

James Adkins, auditor of the Lindell Railway: "Beginning with January 1, 1898, I have started to keep my accounts in the manner and along the lines laid out by the Street Railway Accountants' Association, and desire to express my appreciation to you and your co-laborers for the amount and satisfactory work done in relation to these matters."

Frank R. Henry, secretary and treasurer of the Missouri Railroad: "In order to encourage the committee on standard classification of accounts and to help the good work along, it is a pleasure for me to say that on January 1 we rearranged our accounts, and had new statement blanks printed to conform to the report of the committee."

James H. Roach, secretary and treasurer of the Union Depot Railroad: "Please say to your associates of the committee, of which you are chairman, that our company will, after March 31, 1898, adopt the standard system of account, approved by the Accountants' Association at the convention held in Niagara Falls in October last."

PROPOSED ENGLISH ROADS.

Lighting, London, publishes a list of electric lighting and railway enterprises for which application for provisional orders or for private acts of Parliament will be made during 1898. The number of applications scheduled is far in excess of that for any recent year:

	Local Authorities.	Companies.	Total.
Electric Lighting Provisional Orders.....	62	28	90
Electric Lighting Bills.....	2	7	9
Tramway Provisional Orders.....	8	6	14
Tramway Bills.....	19	12	31
Railway (Electric) Bills.....	—	7	7
Light Railways (Electric) Provisional Orders..	—	16	16
Total.....	91	76	167

A few words of explanation regarding provisional orders may not be out of place. Under the Tramways Act of 1870 the Board of Trade upon the application of the local authorities, or upon the application of persons or companies who have already obtained the consent of the local authorities, after hearing protests, etc., may grant a provisional order authorizing the construction of a tramway. This order does not acquire final validity and force until confirmed by Parliament. Advertisement and notices must be given by promoters who contemplate asking for a provisional order in the months of October or November and December preceding.

The conditions imposed by the Tramways Act are very onerous, and on the passage of what is known as the Light Railways Act—which did not, however, define a "light railway"—many promoters of tramways endeavored to incorporate under the new law, which was much less exacting. It is stated that the Board of Trade at first approved of, or at least winked at, the practice, but now is inclined to define a light railway as a suburban or interurban line.

The Capital Traction Company was chartered September, 1895, being organized under an act of Congress, approved March 1, 1895, which authorized the Rock Creek Railway Company to contract with any intersecting line for its joint management, lease or purchase and joint operation, and to increase its capital stock by an amount not in excess of the actual cost involved in the consolidation, provided one fare only were charged by the new company. Under this act the Washington & Georgetown Railroad, whose charter did not permit it to purchase or lease other lines, was acquired by the Rock Creek Railway, and the two merged into the Capital Traction.

The Washington & Georgetown Railroad was organized in 1862, and was operated by horses until equipped for cable traction, the 7th street line about 1888 and the Pennsylvania avenue line in 1891; this road, with its 21.5 miles of track, constituted the cable mileage of the Capital Company. The Rock Creek Railway was organized in 1888, the motive power being electricity, and opened in 1892; the mileage comprises 6.25 miles of double track operated with the overhead trolley and 1.14 miles of double track with the Love conduit.

The road is an important one, the traffic being much heavier than might be expected in a city of only 300,000 inhabitants. The total mileage of the road is but 36 miles, and in 1896 the number of passengers carried was 22,700,000. For comparison the mileage and passengers carried in 1896 are given for the three important Chicago roads: Chicago City, 184 miles, 95,000,000 passengers; North Chicago Railroad, 100 miles, 56,500,000 passengers; West Chicago system, 250 miles, 79,500,000 passengers. This will serve to explain how the company could afford the cable construction.

As noted in the "Review" for November last, page 800, the Capital Traction is now engaged in equipping the cable conduit on the Pennsylvania avenue line with conductors for operation on the General Electric underground system. Through the courtesy of D. L. Carl, chief engineer and superintendent of the company, we have received the plans of the work.

The diagram showing the location of the underground feeder conduits will serve also to give a general idea of the location of the lines in the city. It will be remembered, of course, that Pennsylvania avenue does not meet 14th street at right angles, but at an angle of 60°. The ducts on Pennsylvania avenue and 14th street have practically been all laid, the total, counting each line as a single duct, is 382,074 ft., and includes more than will be used at present, provision being made for future extensions.

The standard feeder manhole is shown in plan and in section by Fig. 2, and the drawing is sufficiently clear to require no explanation. The manholes are placed between the tracks at intervals of 400 ft. The feeders are connected to the conductor bars at every alternate manhole.

Fig. 3 shows a section of the conduit and method of securing the conductor bars to the insulators and the method of bonding them at the joints. It will be seen that the insulator is that used on the newer work of the Metropolitan in New York. To protect the conductor bars, the old cable slot rails are provided with drip flanges by riveting



1 in. x 1 in. angles to them as shown. The provisions for draining the cable conduit were considered ample, and none additional were made.

Fig. 4 is a sketch showing the plow as it is carried on the hangers and in the conduit.

Along the straight track the traps which were already in place were spaced 31 ft. 6 in. apart between the slot and the outer rail on each track. These have been supplemented by three times as many smaller traps so that access may be had to each insulator; the insulators are spaced 15 ft. 9 in. apart and the traps are in pairs, one either side of the slot. On curves the original traps were 2 ft. 8 in. long and spaced 4 ft. 6 in. between centers; the insulators on the curves have

been spaced about 9 ft. apart, small traps being added where necessary, i. e., opposite every alternate large one.

The contract for the street work was let to E. Saxton, of Washington, who, as our readers probably remember, installed the conduit for the Metropolitan Company. On December 20, Mr. Saxton commenced the installation of the conductor bars, insulators, drip bars, etc., on the 14th street line, and the work will be pushed to completion as rapidly as possible.

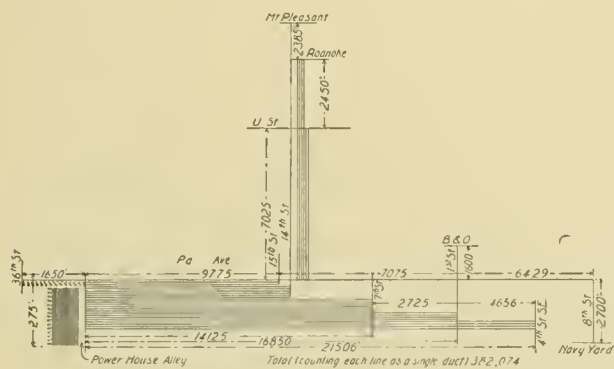


FIG. 1.—DIAGRAM OF FEEDER DUCTS.

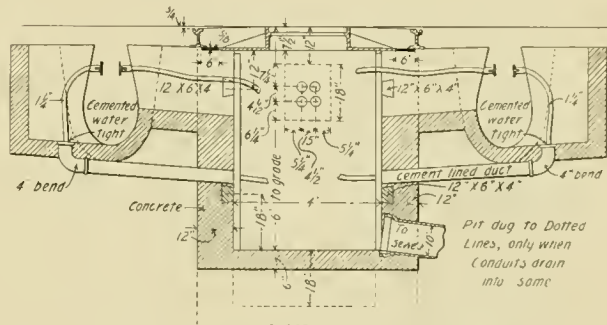
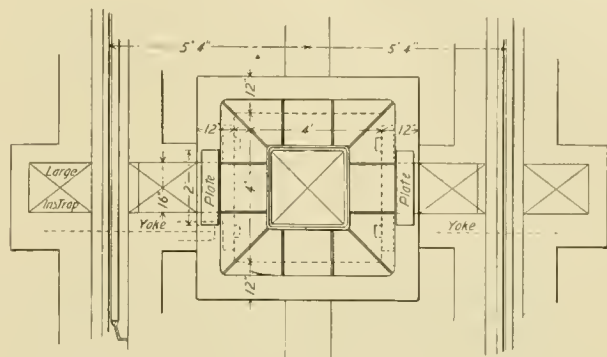


FIG. 2.—STANDARD FEEDER MANHOLE.

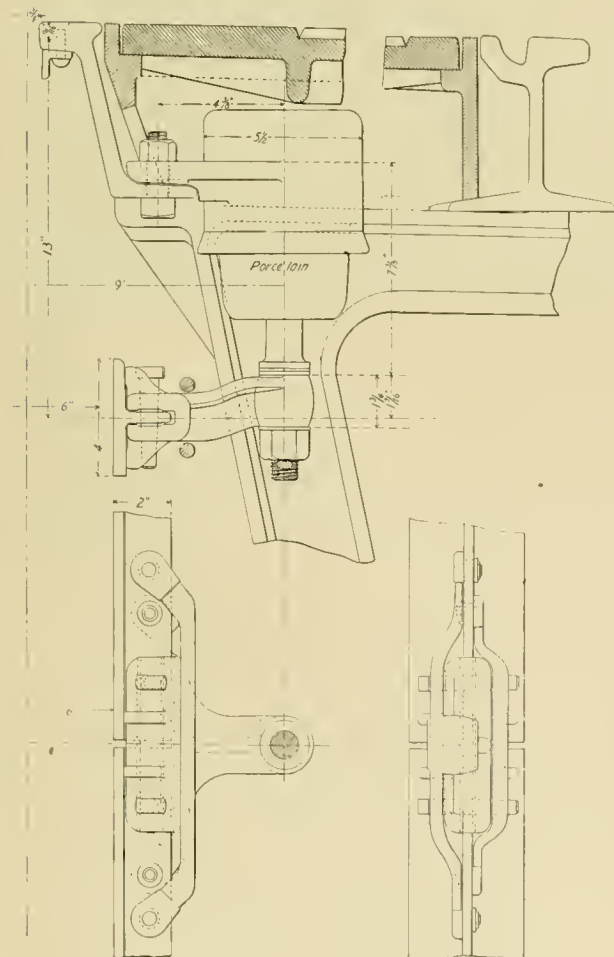


FIG. 3.—SECTION SHOWING INSULATOR.

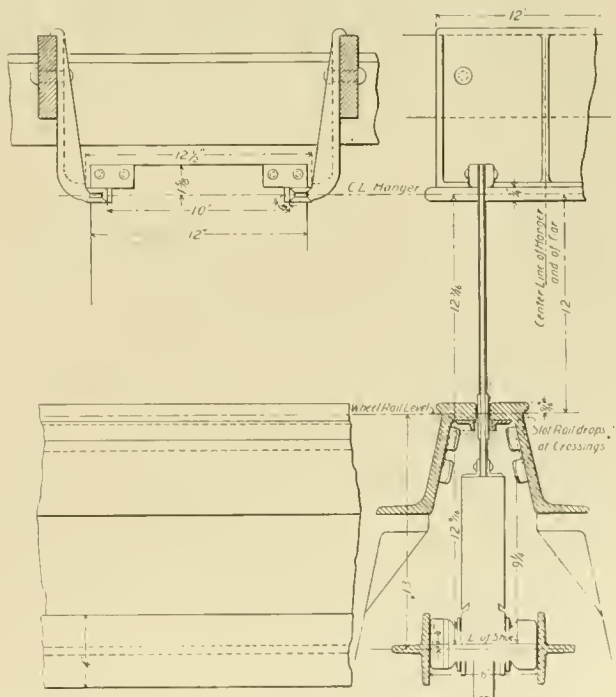


FIG. 4.—PLOW AND HANGER.

The new power plant is located in Georgetown, where a building, formerly used for manufacturing purposes, has been secured. This building is 62x208 ft., with one long front on Grace street and the other along the canal. The canal will furnish a water supply, and the Potomac river will serve to transport coal. A number of changes in the floor levels, etc., are proposed. The boiler room is to be 160 ft. long and occupy one end of the building. The engine room is in the other end, the floor being about 8 ft. above the boiler room floor and 13 ft. above the basement.

The power house installation, at present contemplated, comprises three Cahall-Babcock & Wilcox water tube boilers of 600 h. p. each, carrying steam at 130 lbs., and three Allis tandem compound engines of 750 h. p. each, direct connected to General Electric multipolar railway generators. Boosters will also be used. The generators are of 525 k. w. capacity, with a voltage of 550 at no load and 600 at full load.

### ANNUAL MEETING OF NORTH AND WEST CHICAGO STREET RAILROADS.

The annual meeting of the North and West Chicago Street Railroads occurred in this city January 11; the Yerkes surface properties made an excellent showing. Eight months of '97 were poor business, while the last four months of the year were very good. The North Chicago Street Railroad earned 14.47 per cent on its capital stock—a trifle less than in '96. The gross earnings were \$2,911,552, and the operating expenses, \$1,319,926, which left a net of \$1,591,625. Out of this fixed and special charges (such as wiping out World's Fair stock) were taken, leaving for dividends \$955,162. After paying usual dividends, \$163,220 was carried to the income account. No noteworthy improvements in plant were installed during the year, and no radical changes are contemplated. The connection of the outside suburban lines as feeders has proved conclusively the importance of the arrangement. Following are some of the details of operation:

	1896.	1897.
Percentage operating expenses.....	49.32	46.83
Passengers carried.....	56,523,620	56,354,147
Miles run.....	10,590,936	11,641,210
Passengers per mile.....		5.3
Receipts per mile.....		2.75
RECEIPTS.		
	1896.	1897.
Cable lines.....	\$1,575,311.05	\$1,421,487.78
Electric lines.....	1,192,641.85	1,377,063.57
Horse lines.....	98,887.75	20,911.75
Total receipts.....	\$2,824,800.65	\$2,818,398.10
Percentage Operating Expenses		
	1896.	1897.
Cable.....	45.17	47.67
Electric.....	51.22	44.92
Horse.....	90.98	115.23
Cost Per Car-Mile—		
	1896.	1897.
Cable.....	13	13.4
Electric.....	12.5	11.4
Horse.....	22.1	20.6

Directors:— Charles T. Yerkes, W. F. Foubek, Benjamin B. Lamb, F. H. Winston and J. Charles Moore.

#### WEST CHICAGO STREET RAILROAD.

This road, which has two elevated systems electrically operated in competition with it, earned 6.32 per cent on its

capital stock, as against 6.52 per cent the previous year. Receipts fell off \$125,283, but operating expenses were reduced \$208,704. The receipts for 1897 were \$3,801,918; operating expenses, \$1,920,664, leaving a profit from operating of \$1,970,253. After paying fixed charges there is left for dividends, \$824,068. The opening of the Union Loop to the elevated roads was expected to seriously cripple the earnings of the surface lines, but on this point Mr. Yerkes says:—

"It was expected that the opening of the loop would have an effect upon the business of this company, but, strange to say, notwithstanding the fact that the loop commenced business the fore part of October, the increase in receipts for October over the same month last year was over \$22,000.

"There is no doubt in my mind that it does have some effect on our company, but the truth is that better facilities induce travel, and while it is possible that our increase since the loop commenced running would have been greater, yet it is certain that the opening of the loop has produced an increase in travel.

"As I said to you last year, the prospect for the future depended entirely on the general business of the country, which at that time did not look very bright, so that prospects for this year depend on the same cause; but the reverse this year is the case, because there never was a brighter outlook for the business interests of this country than at the present time."

The election of directors resulted as follows: Charles T. Yerkes, W. L. Elkins, P. A. B. Widener, Harvey T. Weeks, S. W. Rawson, F. H. Winston and J. M. Roach. The election was unanimous.

#### THE LAKE STREET ELEVATED

held its annual meeting the same day, and President Louderback reported that the road had seen its worst days, and from now on would be on the gain. The earnings for the year were \$579,960; the operating expenses \$329,124. The deficit for the year is \$72,842, but this includes the expense of raising the structure at Rockwell street, which cost some \$31,000, etc.

### AN ECHO OF THE CLEVELAND STRIKE.

During the street railway strike in Cleveland in 1892, the strikers were enjoined from interfering with the operations of the lines. Fourteen men derailed a car in violation of the order and were taken before the court on a charge of contempt, being fined in sums ranging from \$200 to \$500 each. Exceptions were taken to some of the rulings of the circuit court and the cases taken to the supreme court on appeal. On December 7 last the supreme court gave its decision, affirming the judgment of the circuit court.

### PREPARING FOR COMPETITION.

It is rumored on what appears to be good authority that the Detroit & Lima Northern Railroad will equip its Toledo-Detroit line with steam dummies in order that it may maintain a shorter headway and be in better shape to compete with the electric line which is contemplated between those cities. It is understood that the company is negotiating with the Schenectady Locomotive works for three combination locomotive trucks similar to the one furnished recently to the New England Railroad.



### A TYPICAL COUNTRY TROLLEY ROAD.

The introduction of the electric motor is doing a great work in bringing out-of-the-way districts into close communication with the great cities. The great trunk line steam roads connect sections and business centers and branch roads reach out to important cities and towns, but there are districts and villages of more or less importance in the commercial world, within 10 or 20 miles of trunk lines, that appear almost out of the world; simply because the trunk line cannot see its way to construct and equip a spur to their doors. Often there will be heavy grades, and again there may be so many cuts and fills required that it would cost more for the steam road than the returns would warrant. The steam road causes new cities and new centers to rise and flourish, while the small city or village that once

propelled by the very stream that furrows the neglected valley. The road and the power plant to run it can be owned by the community it reaches, making it master of its own toll gate.

There is perhaps no better illustration of taking advantage of conditions than the work done by the Shelburne Falls & Colrain Street Railway Company, at Shelburne Falls, Mass. Here is a typical country railway. The Fitchburg Railroad, in its course from Albany to Boston, failed to pass through Colrain City, leaving it several hours, by team, farther from Boston and New York than some of its more favored rivals. Colrain City is at the head of a beautiful valley that is rich in agriculture, also several factories of various kinds find motive power in the small river that drains it.

About a year ago a company was formed of factory own-



POWER HOUSE AND CAR BARN—SHELBURNE FALLS & COLRAIN STREET RAILWAY.

was the boasted pride of a section has been sapped of its wealth and power because the main line missed it by a few miles. This condition exists in so many localities in the eastern and middle states, that Goldsmith's "Deserted Village" becomes almost a reality to the traveler in these sections.

The time was when the wealth and power of our country was found principally in these smaller business centers, but the railroads have so changed the conditions that the smaller towns now are only agents for the great cities, and their success as agents depends upon their facilities for handling products that are shipped to and from the great centers of trade. The trolley road is destined in a measure to restore to many of these "side tracked" villages some of the advantages lost by being "out of line." The trolley car can climb steep grades, round short curves, and cross rivers on wagon bridges. It can carry freight, passengers and mail as readily as the trunk line, putting the population of an out-of-the-way valley into direct communication with the world at large. Last, but not least, the trolley car can be

ers and citizens generally, for the purpose of constructing an electric railway beginning at Colrain City, touching at Griswoldville and at Shattuckville, intersecting the Fitchburg road at Shelburne Falls. An unused water-power was secured near the center of the line, and on this site a power house and car barn were built. A second car barn was also built at Colrain City.

The power is supplied by a pair of 27-in. turbine water wheels working under 20-ft. head and furnished by the Holyoke Machine Company, Worcester, Mass. The speed of these wheels is regulated by a governor built by the Replogle Governor Works, Akron, Ohio. As it was necessary to carry the water from the dam to the wheels in a long iron feed-pipe it was also found necessary to make all the pulleys very heavy in order to counteract the bad effects of the long closed flume. In other words, care was taken to add ample balance-wheel effect, with the result that the plant is well governed for the work required of it. The power is transmitted by belt to two 75-k. w. multipolar generators built by the Westinghouse Electric & Manufactur-

ing Company, Pittsburg, Pa. The generators are driven from a line shaft that is provided with the necessary cut-out clutches. The line shaft can be separated from the water-wheels and the supplementary engine, or connected at will, by sleeve clutch pulleys. The engine reserve consists of one cross-compound Fitchburg engine 12 and 20x24 in. and a No. 16 Deane jet condenser, and is supplied from one horizontal tubular boiler 18 ft. x 6 ft.

The road comprises six and one-half miles of main line and about one-half mile of spurs. It follows the entire length of the principal street in Shelburne Falls, and when finished will meet the Fitchburg road on the south side of the river.

The motor equipment consists of six No. 12 Westinghouse motors on three Bemis trucks, two No. 38 Westinghouse motors on a double truck, and two No. 38 motors under a snow plow mounted on the wheel axles.

There are one combination car for passengers, express, baggage and United States mail, one 26-ft. closed car, one 28-ft. open car, one 34-ft. open car, and two trailers. There are also four box cars and four flat cars for freight traffic.

The freight traffic on this road has reached as high as 660 tons in one month, and consists of cotton, coal, manufac-



A VIEW ALONG THE LINE.

tured products, etc. The passenger service is well patronized, and consists of 14 trains daily from Colrain City to Shelburne Falls and return, also special trains when traffic demands them. The Sunday service consists of 10 trains each way. We do not have information concerning the average number of passengers carried daily, but on July 5 last the records show that 3,208 fares were collected.

The management is making preparations for a park at the Colrain City end of the line, and the indications are that the enterprise is a success from all points of view. The immediate operation of the road has been in the hands of L. N. Wheelock, electrician and superintendent. G. W. Smead is engineer and superintendent of power house.

While this road is a success, there were many difficulties to overcome. Part of the roadbed is immediately on the river bank, where a spouty and spongy surface had to be provided against. Other parts have steep grades and not a few curves. Also a few difficulties presented themselves in the construction of a power plant, but the fact that all these difficulties have been overcome proves conclusively that small manufacturing towns can bring themselves closer to

market by their own exertions, and in doing so can compete with the world in the products of their factories, with the advantage of the benefits to be derived from low taxes, cheap labor, and healthy homes.

#### FRANCHISE CASE IN CALIFORNIA.

Through the courtesy of E. I. Tolle, manager of the Santa Ana & Orange Motor Company, Santa Ana, Cal., we have received a copy of a decision by the Superior Court of Orange county, in which the grant of its franchise is sustained. The company had secured a franchise for operating a street railway with animal, electric, or steam power, and several suits were brought against the city to have the grant annulled, but the city was in each case successful.

The suit in which we have the opinion was by one Hill. The decision was adverse to the plaintiff on two grounds: 1. His interest as a citizen and taxpayer, not being different from that of any other citizen or taxpayer, gave him no standing in court. 2. The writ was to review judicial functions only, while the action of the Board of Trustees in granting the franchise was legislative only.

The dicta on other points raised are also interesting. It was contended the franchise had been changed after the bid of the purchaser had been accepted, by changing the gage of the proposed road and also by withdrawing the privilege of running trail cars. This was conceded by the court, but he added that no one but the company had any right to complain.

It was also contended that the franchise was not that of a street railway, but the court held that it was. The grant is "the right, privilege, franchise and permission granted, etc., for a term of 50 years to construct, operate and maintain a motor railroad with all necessary turn-outs and switches upon and along Main street in said city of Santa Ana, from Second street to the north boundary line of said city, upon and along the line now occupied by the track of the Santa Ana, Orange & Tustin Street Railway Company whereon passenger cars may be propelled by horses, mules, electric power or by steam motor cars, similar to the one now in use on said track."

This latter company sold part of its tracks to the Santa Ana & Orange Motor Company, and removed the others.

#### RAPID TRANSIT IN NEW YORK.

We again hear of an underground rapid transit line for New York which is to be built by a syndicate comprising the Astors, the Vanderbilts and J. Pierpont Morgan, the same syndicate that announces that it has secured an option on the New York & Brooklyn Railroad Company, which has the right to construct a tunnel under the East river from Broadway and Ann street to Fulton and Furman streets in Brooklyn. The proposition is to build a road to cost \$35,000,000 and at the end of 50 years turn it all over to the city for nothing; the city is to be at no expense whatever, merely "lending its credit," which we take to mean that the city is expected to guarantee the \$35,000,000 worth of bonds.

The brickmakers of Springwells, Mich., contemplate using the new electric road from Detroit to Ann Arbor for marketing their product, and save a 5-mile haul by team.



### BURNING LOCOMOTIVE "SPARKS."

In the paper read by Colonel Heft at the street railway convention was the statement: "I suppose we are producing power more cheaply than can be done in any power station in the country using coal as fuel, the reason being we are burning sparks." E. C. Boynton explains in the *American Engineer, Car Builder and Railroad Journal*, how these sparks are used as fuel in the power houses of the N. Y., N. H. & H. Railroad at Berlin, Nantasket and Stamford.

The sparks consist of fine particles of coal, half consumed, that are removed from the extension fronts of the locomotives. These are shipped direct to the stations and fed into the furnaces without the addition of coal or other fuels. Some difficulties were experienced at first in the firing as it requires about twice as great a quantity of sparks as it does of coal. The fire increases so rapidly in thickness that it must be cleaned at intervals of three to four hours. One furnace is cleaned at a time, but an even steam pressure is maintained through the process, as the fire is quickly brought up to the required temperature by the aid of a blower. The fireman has to be educated for this work, as it is radically different from coal firing.

Some alterations in the boiler settings were necessary; the boilers are the ordinary horizontal flue type, 72 in. in diameter and 19 ft. long. Extending across and resting on top of the brick settings, at right angles to the boilers, are two pairs of heavy channel irons. From these four iron rods extend down to the sides of each boiler, two on either side near the ends of the boiler. These rods hook into lugs riveted on the sides of the boiler, at the center line; the boilers are thus suspended from four points, and this provides for all movement due to expansion and contraction. A large combustion chamber is secured by setting the boiler so that the shell is 44 in. above the grate bars and the top of the bridge wall only 18 in. above them.

A forced draft comes from a steam blower which consists of a cast iron cylinder 9 in. in diameter and 24 in. long, bell mouthed at one end, and extending through the boiler front into the ash pit. The fine steam jet blowing into the ash pit draws a large quantity of air with it. When the steam pressure is reduced the efficiency of the blower decreases rapidly, and in firing this has to be guarded against. The normal steam pressure is 100 lbs., but for heavy loads 125 lbs. is carried. About 6 lbs. of sparks are consumed per horse-power-hour.

### CANON CITY & CRIPPLE CREEK ELECTRIC RAILWAY.

One of the most interesting roads in the process of construction is the one between Cañon City, Colo., and the famous mining camp of Cripple Creek. This road was built for the purpose of furnishing cheap transportation, so that low grade ores could be carried to the mills and worked with profit. The Florence & Cripple Creek Railway, a narrow gage steam road, has a monopoly of this traffic, and its rates have been so excessive as to invite competition. Passenger rates are uniformly 10 cents mile, and the freight rates even higher in proportion, so that coal, which is mined in abundance in Cañon City, costs \$8 a ton in Cripple Creek. This railroad is 43 miles long, with an average grade of 7 per cent, and but one-fourth of it is straight track. In an air-line distance between the two cities of 18 miles the difference in altitude is nearly 5,000 ft.

The Cañon City & Cripple Creek Construction Company has been more fortunate in the selection of its route, as the grades will be but 5 per cent and the length of track 35 miles. More than 11 miles of this roadbed are now ready for the ties and rails, and 600 workmen are making rapid progress with the rest of the work. Contracts for the electrical apparatus have not been let. The power station will be located in Cañon City, where there are fine deposits of coal, little inferior in quality to anthracite. Probably alternating currents will be used in transmitting the power to sub-stations along the line. The electric locomotives will be sufficiently powerful to draw 20 cars, each loaded with 33,000 lbs. of freight, up the steep grades. The road will be standard gage. Its estimated cost is \$800,000. The freight business will consist in hauling coal and merchandise from the railroad in Cañon City to Cripple Creek, and ore from the mining camps to the reduction works in Cañon City. The conditions seem to justify such a road. Cripple Creek and vicinity has a population of 50,000, and the value of the minerals mined during the past month is \$1,500,000. The Chicago office is in charge of Paul E. Hirsch, who is treasurer of the company.

### A BALLOON RAILWAY.

We take the following from the *Mechanical World*:

A mountain railway constructed on a novel plan is shortly to be opened on the Hochstauffen, near Bad Reichenhall, Bavaria. The chief feature of the new system is that the force of traction is directed vertically upwards, being derived from a balloon. The latter has a diameter of 66 ft., and a lifting power of 10,560 lbs. The balloon, car, net, ropes, etc., weigh 4,620 lbs., and an allowance of 3,300 lbs. is made for passengers and aeronauts, leaving a margin of 2,640 lbs. A single rail is used for the sole purpose of directing the course of the train and keeping the balloon with its load captive. To this end the rail is made T-shaped, and the car runs on it, gripping it from the sides and from below. The rail is anchored to the ground at distances of about 15 ft. In descending the mountain the propelling force is gravity, and the balloon acts as a check to prevent accelerated motion. A ballast of water, taken in at the top of the mountain, provides the additional downward force required. The difference in weight caused by passengers entering or leaving the car is regulated by the use of separate weights.

### JOINT USE OF TRACKS IN NEW YORK.

The opinion of the New York Court of Appeals in what is known as the "Kingston case" where one street railway sought to condemn a right of way over the tracks of another is given at length on another page. There has been some doubt as to whether this ruling would prevent the operation of the cars of one company over the tracks of another by mutual agreement, unless the consents of the abutting property owners were also obtained.

In an interview Justice Haight of the Court of Appeals states that the question of joint operation by mutual agreement of the two companies is yet an open one, the Kingston decision having to do only with the question of condemning a right of way.

It is probable that a case to determine this open question will be brought before the court.

## REPAIR SHOP OF THE CHICAGO CITY RAILWAY.

The question of repairs on a railway system, whether it be large or small, is an important one to the management. Many nice problems in economy present themselves; infrequent repairs, parts requiring special tools, castings of various kinds, armature windings, gears, etc., are in some cases cheaper to buy than to make, while other shops have the facilities to save manufacturers' profits. The general manager or master mechanic must decide these questions and only put such sums of money in tools and buildings as the savings justify. In some of the larger cities the shops of the railway companies are very extensive, and as much machinery and as many men are employed as in a large

a repair shop depends so much upon its management that it might be well to say a few words regarding its chief. C. E. Moore, master-mechanic of the Chicago City Railway since October, 1895, has been largely instrumental in making the repair shop what it is today. His mechanical training commenced by serving a seven-year apprenticeship in Cincinnati and in Evansville. He then became tool maker for the Vandalia Railroad, later for the Belt Railroad of Chicago, and afterwards for the Lake Shore & Michigan Southern. He has a practical and thorough knowledge of the minute details of machine and blacksmith shop practice. Many of the labor saving devices are of Mr. Moore's design.

From the office the visitor passes directly into the machine shop; partitioned off only by a railing is the power

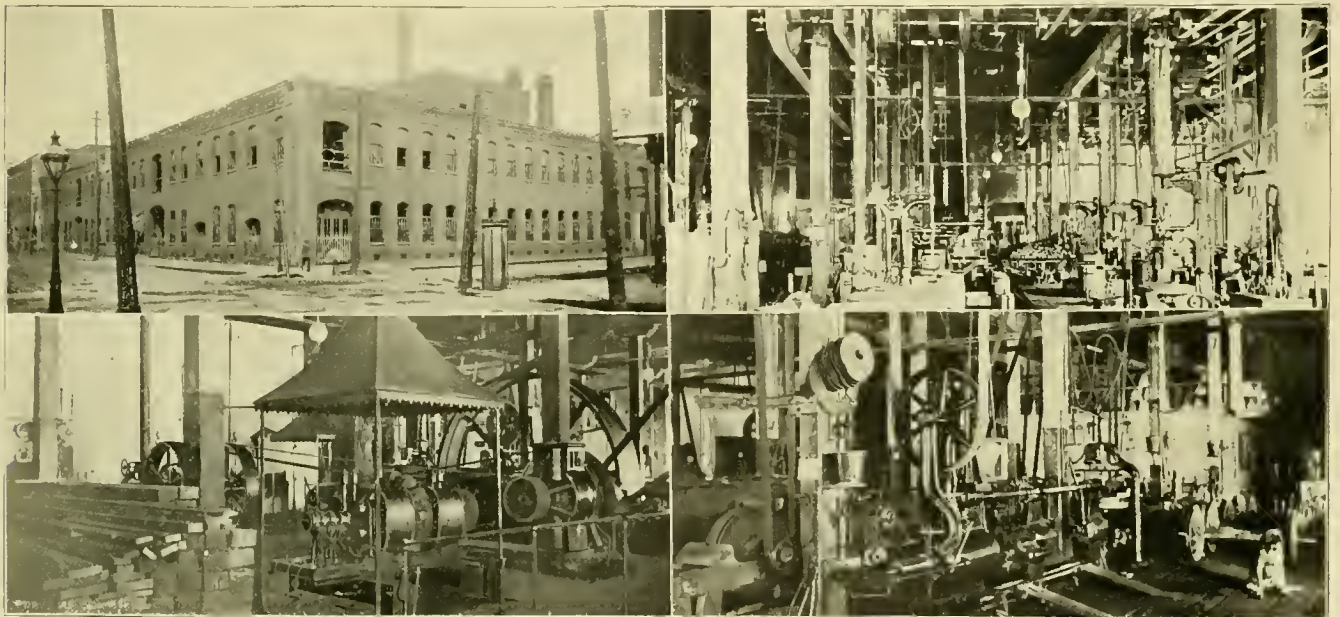


FIG. 1.—CHICAGO CITY RAILWAY SHOP.  
FIG. 2.—POWER PLANT.

FIG. 3.—MACHINE SHOPS.  
FIG. 4.—WHEEL PRESS.

manufacturing establishment. Such an institution is the repair shop of the Chicago City Railway which has been built up under the supervision of M. K. Bowen, general manager.

The building, Fig. 1, is in the rear of the State street cable power house, facing on Dearborn street and occupying a block between 20th and 21st streets. Part of it is a relic of the horse car days, but the construction is substantial and serves the purpose as well as a more modern structure. For the most part the building is two stories in height, each having a floor space of 45,000 sq. ft., but the third is a monitor story built between the skylights and has an area of 20,000 sq. ft. All this makes available a floor space of nearly three acres. Besides this a basement, lighted by incandescent lamps, is used for storing rough iron and brass castings.

The office is in the front of the building midway in the block, and an entrance is assured by pulling a rope attached to a gong. The latch-string, as it were, is always hanging out, and one of the commendable features of the Chicago City Railway is soon in evidence, i. e., information of service to street railway men is freely given. The efficiency of

and electric light plant, Fig. 2. A 75-h. p. Wheelock-Corliss engine is supplied with steam from the boilers of the station across the alley. The cylinder dimensions are 18x46 in. and the speed is 60 r. p. m. This engine drives the shafting which extends into the machine shop, the wood room, and up to the second and third floors, belting being used throughout. The building is lighted by 88 arc and 350 incandescent lamps. The incandescent machine is belted to a jackshaft driven direct from the shop engine and can be started or stopped at any time by means of a tight and loose pulley. The two arc light dynamos, a Brush 50-lamp and an Excelsior 45-lamp are belted to an Ideal engine, 13x13 in., 275 r. p. m., and these are run during the mornings, dark days and for night work. Both arc and incandescent circuits are connected to the switchboard, the incandescent lamps being in four circuits. Two Weston ammeters are in the arc circuits and an ammeter and a voltmeter, made by the Standard Electric Company, are in the incandescent light circuit. The entire building is heated throughout by exhaust steam from the cable power station.

A compressed air system has been installed which facilitates some lines of work. The double air compressor, of



Pedric & Ayres make, has a capacity of 120 cu. ft. of air per minute and is belt driven. An attachment on this machine automatically shifts the belt when the pressure rises above 80 lbs. In the basement are two storage tanks made of old vertical boilers with tubes removed and with pipe connections. A 3-in. pipe extends to the third floor with a cross connection at each floor, and supply pipes run the entire length of the building with T connections at convenient intervals. The air is used for the hoists, for the lifting devices, for the wheel press, for sanding glass, for cleaning castings and motors, and blowing the shop whistle.

To the south of the power plant is the machine shop, Fig. 3, which has the following equipment of machines: 7 engine lathes, 1 turret lathe, 6 drill presses, 1 turret drill press, 1 planer, 1 shaper, 1 milling machine, 1 boring machine, 1 hydrostatic press, 1 car-wheel grinder, 1 large Q. & C. cold metal saw, 1 power hack-saw, 1 air compressor, 1 tool grinder and 4 air lifts.

The tool room is just to the rear of the office; in it every tool has a place and is labeled, being drawn out only on a check. Files, screws, rivets, tool steel, etc., are also kept here. The sharpening and grinding are all attended to by one man. Some of the machines have been inherited from horse car days, but they have been kept in good repair and others added as requirements demanded. From the Dearborn street entrance the cable grips in need of repairs are brought in on a supply car. By means of a telescope air hoist they are lifted and carried along the overhead track to the blocks where the necessary repairs are made. Along one side of the shop run the work benches built out 3 ft. from the wall so that the floors can be easily cleaned and a double crew of men can use each bench. Along the edges of the benches are steel strips set in the wood so that the upper surface is flush with the top. This construction insures a true and permanent edge.

Along the partition dividing the machine shop from the foundry is a row of ventilated closets for the workmen. These closets have sloping tops which prevent the accumulation of waste and old clothes. Hooks on the outside are for the accommodation of overalls and greasy garments, as the inside is kept neat and clean for street apparel.

The equipment of machines in the shop is very complete and designed to accommodate the heaviest work at any time. The turret lathe has provision for six tools, which are generally used for brass work. Brass hangers, pull-offs and other parts of overhead work can be bored, faced-off and threaded with one adjustment of the chuck. Inside and outside threads and all kinds of chucking and boring can be done on this machine. The six-headed turret drill press with 1 1/4-in. spindles is also a time saver, for with templates and jigs such pieces as controller segments with different sized holes at different angles may be drilled very quickly and with cheap labor. The No. 1 universal milling machine is valuable for heavy fast work. A trolley wheel can be milled in 4 minutes with a B. & S. relieved cutter. The power hack-saw does the work of one man and only requires the odd moments of a lathe hand, who adjusts the lengths of the pieces to be cut. It will saw bars up to 4x4 in. The saws, being held by constant tension, wear much longer than by hand use.

The wheel press, Fig. 4, has been rebuilt from an old-styled machine which was operated by hand; now the power is transmitted through bevel gears to the counter-shaft and a belt run to the press pulley. Two different

sized cylinders, side by side, both work at first to fill the press with water, then the small plunger is actuated alone to get high pressures. In a glass case above the machine is a working gage, also a test gage which is used at times to standardize the other; both register in tons. The most convenient arrangement is the latest addition, a lift

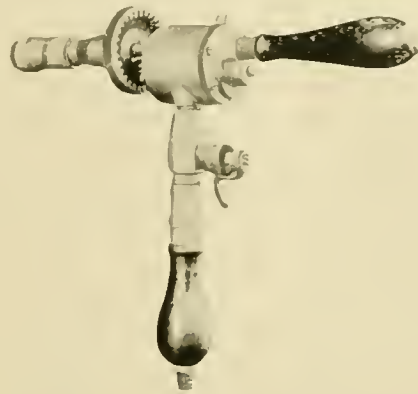


FIG. 5.

for raising the wheels into position. It was quite laborious to place the heavy wheels and axles in position in the press by hand. An air cylinder was placed on a stand under the floor with a horizontal beam resting on the piston rod. At the ends of the beam are vertical pieces under the two plates. In the bulb of the air valve a hole is drilled which permits the exhaust as soon as the valve is closed. The wheels are slipped on the axles and rolled on the two iron plates. The knob on the valve stem is then shoved down by the helper's foot and both plates with the wheels and axles are lifted up and the wheels roll into place in the press by gravity. If the wheels are for motor cars a pressure of 30 to 40 tons is exerted; if for trailer, 20 to 30 tons. At the end of the hydraulic cylinder there is a small brass one and its piston is connected to the ram. After a pair of wheels has been pressed on and the ram is to be returned to its former position a valve in the compressed

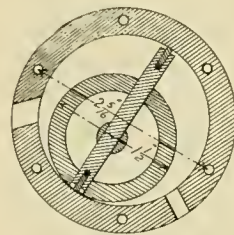


FIG. 6.

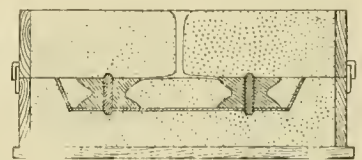
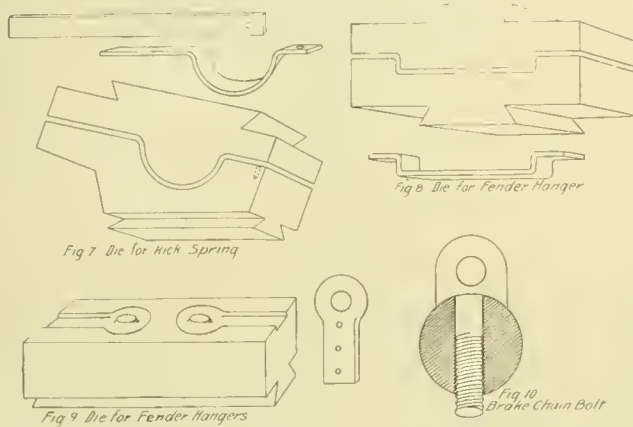


FIG. 6 A.

air pipes leading to the brass cylinder is opened and the air pressure does the work previously done by weights. The wheel grinder has two 18-in. emery wheels which rotate at 900 r. p. m.; the car wheels are revolved at 20 r. p. m. From 8 to 12 pairs of wheels are ground per day. On account of the very hard service the wheels do not have a long life.

Another handy air tool is the drill shown in Fig. 5. In repairing cars, holes have to be bored in the sills and other wood work with a brace and bit, which requires much time and labor. This device is designed to do such work quickly and easily. A bit is placed in the jaws and a flexible hose from the air pipe is connected to the end of the handle. Fig. 6 shows the cross section of the turbine, the revolving part being eccentric to the cylinder. The sliding bar with

springs on either side to prevent leakage of the air, presents a greater surface on one side than the other and is made to rotate. The speed of the turbine is 2,500 r. p. m., which is reduced to 1,000 r. p. m. by the gearing. Another turbine, designed by Frank Perry, foreman of the machine shop, has 10 chambers; this will give a corresponding decrease in speed and increase in power. Holes up to  $\frac{3}{4}$  in.



diameter may be bored. By attaching brushes to the jaws it can be used to clean the dirt from the trucks.

A heavy machine for a street railway shop is the combined shear and punch, made by Hilles & Jones, which will cut a bar 2x6 in. and punch a 2-in. hole through 2-in. metal. Its belt connection is such that it is quick acting, suitable for ordinary work. With a special die bolt holes are punched in the rails in making crossings. This effects a great saving in time over drilling the holes, and with the cold metal saw, crossings can now be made with much less time and labor.

Close by the shears are 10 reels of chains, from 3-16 to  $\frac{1}{2}$  in. in size, which are used for hanging scrapers for brake chains, etc. The reels occupy little space and are convenient to the shears.

All iron castings are purchased of the Wells-French Company, but a foundry has been equipped for brass work, the output last year being 574,000 lbs. As a rule three runs are made each day and nine furnaces are in blast all the time. The 18-in. cupola is utilized for making copper pigs from scrap wire, the insulation being first burnt off. One of the greatest improvements in the foundry is in making molds for trolley wheels by the "pan process". The follow board, with a half of the wheel pattern and a print just the size of the pan, is placed at the bottom of the drag and the sand rammed in. It is rolled over, the board removed and the iron pan dropped into the print left by the follow board. The other half of the pattern is put in place and the pan filled with sand. The cope is filled and removed. The upper half of the pattern is withdrawn, the pan lifted, the lower half of the pattern withdrawn, the center cores put in place and the mold put together for pouring. A section of the mold is shown in Fig. 6A. By this method 72 castings for wheels can be made in eight hours, whereas without the pan only 16 were made. These trolley wheels are milled as described in the "Review" for June last, and the average life is from 14 to 18 months. The mixture for these wheels is 40 lbs. of copper, 5 lbs. of tin,  $1\frac{1}{2}$  lbs. of lead and  $\frac{1}{2}$  lb. of zinc.

The babbiting furnace is simple and convenient, being made from a cannon stove with a sheet iron hood, and has a metal capacity of 300 lbs. Around the upper edge of the caldron is a ledge where the boxes are placed to bring them up to a high temperature before putting them in a two-part hinged mold ready for pouring. A patent "motor metal" has been found to give the best results. The foundry stock room, containing scrap copper wire, brass, antimony, tin, brass nigger heads, etc., is kept under lock and key. The materials are weighed out to the workmen and the stock is kept checked up. All the ashes from the brass foundry are washed and sifted. The bar iron is stored in between the foundry and blacksmith shop, all the different sizes being separated and set on end, in which position the pieces can be easily handled.

The blacksmith shop is especially well equipped with labor saving tools and appliances, there being one small Bradley hammer, one steam hammer, one belt driven drop hammer, three furnaces and eight forges. Whenever there are as many as 500 pieces of one kind to be made, the foreman, Fred Steen, designs a swedge or die for forging or shaping the piece with the drop hammers. For instance, with one of the swedges a front step hanger with brace can be made in 12 minutes with one heat, while only 10 could be made in a day on the anvil by a blacksmith and helper. As an example of the die work, Fig. 7 shows a kick spring for releasing the brakes and the die for making the same. A hole is punched in the piece of iron at the proper distance from the end, placed over the pin in the die and one drop of the hammer gives it the proper form. Fig. 8 represents a die for making a fender hanger with two bends formed by one blow. The lower part of the die for forming the two sizes of straight fender hangers is shown in Fig. 9. The hole is formed by forcing the metal to the edges, thus getting it where it will do the most good. The brake chain eye-bolt has caused much trouble by breaking



FIG. 11. BELT SANDING MACHINE.

off just under the head, until the design shown in Fig. 10 was adopted. The blanks are punched out of mild steel and 20 are drop-forged per hour. As may be seen, the horizontal stress is received by the metal in the head. The



bending tools are of much merit, such things as coupling links, S hooks, rings, etc., being bent either cold or with one heat. Patterns are made for the dies and kept, so that if one be broken another can be made in a short time.

The equipment of the wood room comprises 1 planer, 1 jointer, 2 molding stickers, 2 rip saws, 1 cross cut saw, 1 band saw, 1 scroll saw, 2 shapers, 2 mortising machines,

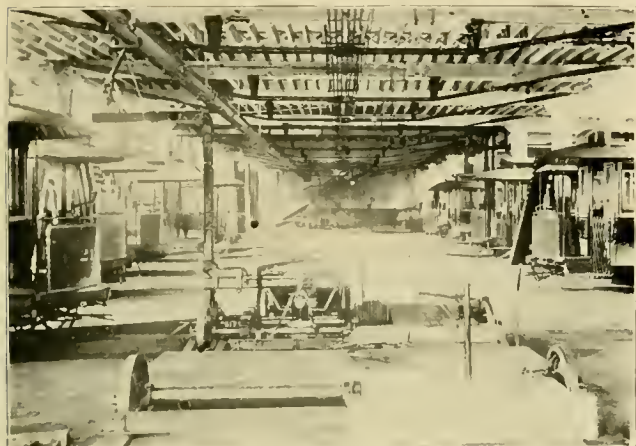


FIG. 12—CAR SHOP.

1 tenoning machine, 1 sandpapering machine, 1 turning lathe, 1 emery wheel.

The swing saw with a hinged bed is very effective in saving time, as bevel cuts can be made by setting a part of the carriage at the desired angle. This machine, as well as the belt sanding machine, Fig. 11, used for sandpapering dash-rails, hammer handles and other irregular shapes in wood, was made in the shop.

A "cyclone" has been built at the rear of the boiler room, the shavings and dust being collected from the planers, saws and cushion cleaner and fed into the boiler furnaces.

In the wood room is the large car elevator operated by a winding drum driven from the shafting. The tracks run direct from the street onto the elevator and the cars are raised to the second floor. They are run on the transfer table and placed on any of the 11 tracks shown in Fig. 12. The table is operated by an 8-h. p. General Electric motor, one man attending to the controller and the other to the rope connected to the double trolley. In this part of the shop 42 cars can be repaired at once; in the north part of the second floor there are six tracks with a capacity for 16 cars; on the third floor 17 cars can be accommodated, and on the first floor are five tracks for 12 cars, four pits and two extra ones for emergency work. The total capacity is 87 30-ft. cars. In the north end of the building only trail and grip cars are handled, because of the limited capacity of the car elevator. The hot water for washing the cars and trucks is taken from a tank into which the condensed steam from the heating system is drained.

Fig. 13 is a view in the paint stock room. Each kind of paint and oil is stored in certain labled cans. The paint is mixed in the cans shown in the cut, by compressed air. The color, oil, etc., are put in the tank in proper proportion, the air passes through the holes in the perforated pipes, and the mixture bubbles violently until it is thoroughly homogeneous. The barrels of oil, paint, etc., are emptied into the tanks by compressed air, four to five minutes only being re-

quired to syphon the contents of one barrel into the tank. All skins, the leavings in buckets of all kinds of paints are saved, ground in the paint mill and toned up a little for truck color. The paints for the car bodies are bought already ground, as it is more economical to do so. At one end of the building is a tank of paint and a drain leading to it. Here the cable-car gates are dipped in the paint and allowed to drain off. One man has charge of the glass department, where all kinds of glass for windows, signs, etc., are cut, fitted and stored.

On the second floor is kept a testing apparatus for gears and pinions. There are a pair of fixed and a pair of movable centers. Along the guides are marks for the proper position of the different sizes. When a lot of gears or pinions are received they are placed in the centers and turned to see that there is no backlash and that they operate smoothly. It is a cheap, easy and practically accurate method. This machine was made in the shop.

On the third floor at the south end are the pattern shop and storage racks, where are kept all patterns for iron and brass work, including molds for Falk joints which are being used in much of the new track construction. North of this is the tin department, where all the tin appliances used about the cars, stations and barns are made. Bent dashes are run through a set of rolls, and, in this way, all the kinks are removed. Copper, silver and nickel plating is also done, the current for the baths comes from a small low voltage dynamo driven from the shafting. There is a large vat of concentrated lye for cleaning the metal work before plating. The pieces are suspended in the bath for a length of time depending on the kind and thickness of the plating. If there is to be a brass oxidized finish the piece is dipped in a solution of chloride of iron, hydrochloric acid and arsenic; if for a copper finish, a solution of sulphuret of potassium is used, and the pieces are then polished in spots. A metal-lined tank of sawdust is heated by steam

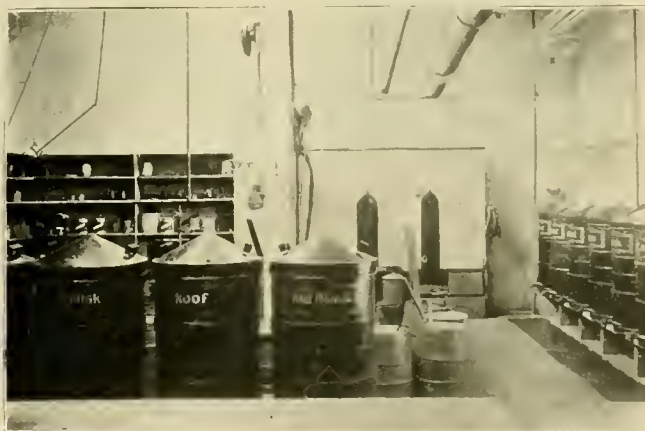


FIG. 13—PAINT STOCK ROOM.

to dry and clean the work. The lacquering work is also done here, put in the oven, and subjected to a temperature of 200° F. for one hour. Once a year the bright work on the Columbia stoves is renickeled and lacquered, the stoves being replaced in the cars early in November.

All the harness, hand straps for cars, and other leather pieces are made on the third floor. The brooms for the sweepers are made from bundles of small cane wrapped in

bunches with linen thread and cemented with rosin and pine tar. The average life of a sweeper broom is about six weeks. The upholstering department is provided with three sewing machines, belt-driven, and other appliances for making curtains, cushions, etc.

The armature coils are all made in the shop, special forms being made to fit the different windings. For turning the commutators and for band winding a 24-in. lathe is used. The motor armatures are also tested when they are sent for repairs. As shown in Fig. 14, there are cases and fields for the General Electric 800, the Westinghouse No. 3 and 12 B, and the other motors which are in service. The switchboard is connected to the trolley circuit and has an ammeter and voltmeter. Each armature is run for 15 minutes at 50 per cent overload, the load being

once a year, and under this system there are cars that have been in service almost constantly for 24 years. From 19 to 20 cars are run into the shops for repair each day. At present there are 256 men at work in the shop, engaged as follows: 15 blacksmiths, 28 machinists, 7 molders, 10 tinners, 1 plumber, 45 painters, 102 carpenters, 5 pattern makers, 14 electricians, 14 truckmen, 3 wagonmakers, 1 harness maker, 2 watchmen, 7 store room men, 2 office men.

#### THE TRAMWAYS AT CORK.

The British Thomson-Houston Company is now constructing in the city of Cork, Ireland, 11 miles of track and will completely equip the system. The track is 3-ft. gage, and the rails weigh 83 lbs. to the yard. In the power sta-

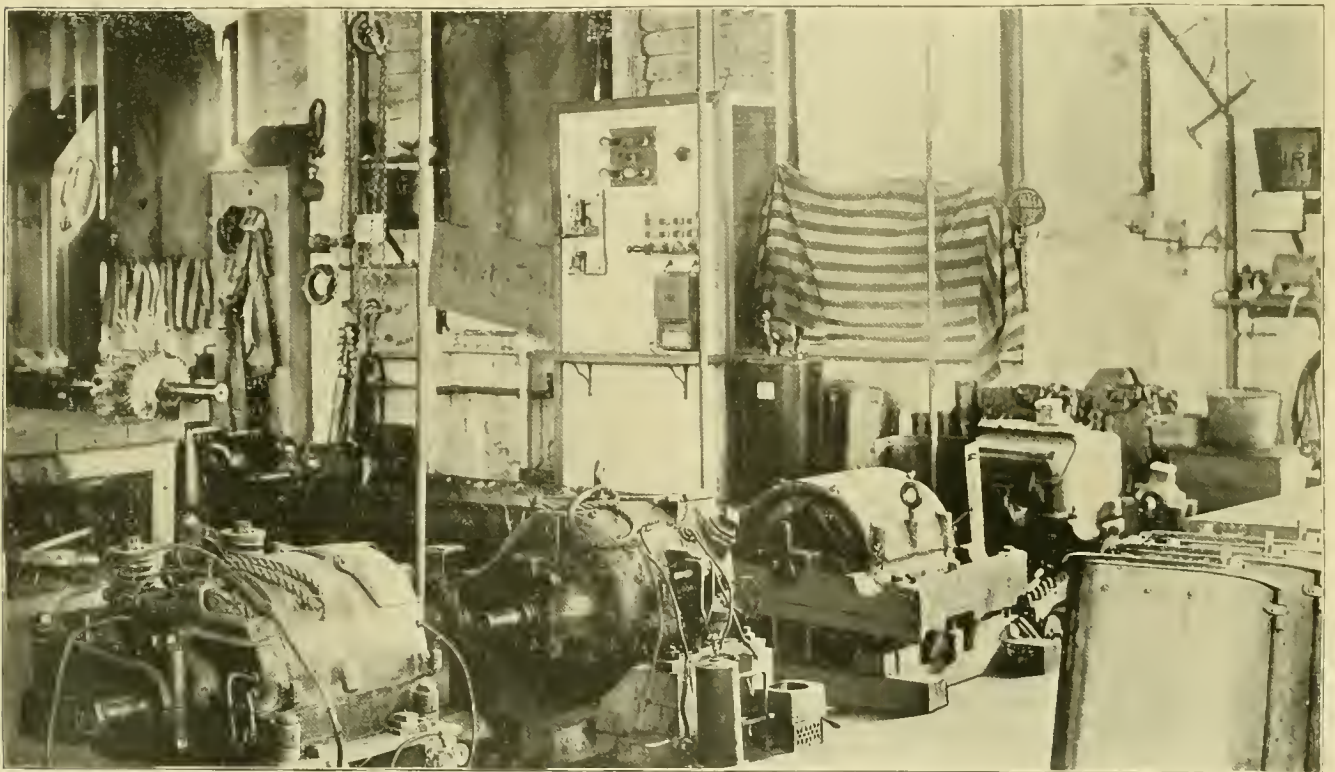


FIG. 14—TESTING DEPARTMENT.

applied by a prony brake, and in that time any faults develop. By this method the number of failures when the armatures are sent to the barns has been reduced 50 per cent. The new drying room recently built is giving good satisfaction. It is a room 10 ft. high and 7x16 ft., brick lined, with corrugated iron roof and double iron doors, and was used for storing shavings before the cyclone was installed. The walls were lined with steam pipes 7 ft. up from the floor, and two ventilators extend from the roof to within a few inches of the floor to carry away the moisture-laden air at the bottom. Iron trestles hold the armatures. At a temperature of 200° F. it now requires 20 hours to dry an armature where formerly it took three to four days.

There are two busy seasons during the year, the first from January 1 to April 1, when the summer cars are overhauled, and from May 1 to August 1, when the winter cars receive attention. Each car is re-varnished and generally repaired

tion there will be three McIntosh & Seymour side-crank, tandem compound, condensing engines direct connected to 200-k. w. generators, and three boilers of American make. In connection with the station there is a storage battery consisting of 256 Tudor cells, capable of discharging 110 amperes for seven hours, with a booster for charging the same. The peculiarity of the station is that it will be used for lighting as well as tramway purposes, the same machines being interchangeable for either service. The cars are to be mounted on single Peckham trucks and will have double motor equipments with series-parallel control.

The bicycle railway at Mt. Holly, N. J., which was such a novelty and financial success a few years ago, is now losing money and will probably be sold under foreclosure proceedings.



## PRIZE EXAMINATION OF THE LINDELL MEN.

As noted in the "Review" for December last, George W. Baumhoff, general manager of the Lindell Railway, St. Louis, conceived the novel idea of calling in all his motormen and conductors and giving them an examination. Fifty questions regarding their duties were propounded, and the answers required without giving the men any opportunity to confer with one another. Prizes ranging from \$25 to \$10 were offered both sets of men for the first, second and third best papers. We give the lists below, which will at once be seen to include questions on all lines of conduct in which the men are desired to be informed, and the instructions regarding which are laid down in the rule book.

Such examinations not only serve to point out to each man any item regarding which he is uncertain, but tend to refresh his memory and impress upon it all the points brought out; and may suggest to even some of the oldest employes the importance of brushing up frequently on the rules. We presume that such employes as gave incorrect answers will be referred to the rule with which they were not familiar at the examination, and the result cannot fail to be an improvement in the service, and stimulate the men to a better knowledge and study of the company's instructions.

### CONDUCTORS.

1. What do you consider the four chief requirements of a conductor, in the order named?
2. What is your duty respecting the handling of the bell cord?
3. Who has charge of the car and to what extent?
4. In case of an accident, what is the conductor's duty?
5. What is the substance of the rule which the conductor is required to read frequently and to his motorman occasionally?
6. Under what circumstances are motormen permitted to pass persons waiting to board the car?
7. In case your car is a little behind time how would you make up the same?
8. What is your position on the car when not engaged in collecting fare?
9. What is your duty when ladies and children and infirm people board or leave the car?
10. During any difficulty or altercation with a passenger what should you strive to do?
11. To what extent are you permitted to use tobacco while on duty?
12. State the rule respecting passengers smoking on the car?
13. State substance of rule respecting expectorating in the car, or on the car floor?
14. What are the small windows on the roof of the car placed there for?
15. During cold weather when should the rear door be permitted to remain open?
16. During dusty weather what do you consider the best preventive from dust entering the car?
17. Would you expect to retain the good opinion of our patrons, and your employers, if you addressed the passengers in a rude or ungentlemanly manner?
- 17A. Have you ever been reported or reprimanded for ungentlemanly conduct?
18. What is the limit to number of passengers on platform when there are seats vacant inside?
19. Why should the passageway from car door to step be kept clear?
20. What is your duty before giving the signal to start?
21. Why should the trolley never be pulled down unless the motorman has shut off the current at the controlling switch?
22. Why should all collections be completed and fares registered before your car arrives at transfer station?
23. Name all bell signals?
24. Are you thoroughly versed in the use of the telephone?
25. How would you secure a connection with the telephone station required?
26. In case of a blockade along the line, whose duty is it to notify the office?
27. What is your duty when discharging passengers if you see them attempt to cross the street after leaving your car?
28. What is your duty respecting the examination of the car assigned to you, before leaving the car shed?
29. What is your duty respecting the examination of car before taking the same from relief conductor?
30. In what condition should the car be left before entering the car shed?
31. State regulation respecting the transportation of employees?

32. How much change should each conductor provide himself with?
33. Under what conditions are you permitted to eject a passenger from the car?
34. What is your duty when the trolley wire is down?
35. What is your duty in case of injury to person or persons?
36. If a bill of large denomination were tendered and you could not return proper change, what course would you pursue?
37. If a person whose statement you did not question should inform you that he or she had no money with which to pay fare, what course would you pursue?
38. Why are some of the poles along the line painted with a single white band?
39. Why are some of the poles along the line painted with a double white band?
40. Why should cars be evenly spaced after a blockade, and not started up together and run in bunches?
41. What is the advantage to the public in having cars operated according to schedule time and on spaces equally divided?
42. What are the rules of the company respecting the carrying of large packages, bicycles, glass and dogs?
43. What would you limit the size of a package permitted to be carried on a car?
44. Why are conductors prohibited from holding the bell cord while the car is at a standstill?
45. What would be your duty after signalling the motorman to stop and before reaching the crossing or stopping place, if a passenger should attempt to leave the car before the same has been brought to a stop?
46. In discharging and taking on passengers, how would you expedite the same—that is to say, where a number of passengers desiring to get off and others anxious to get on at the same time?
47. How should the time on the stand at each end of the road be occupied?
48. Should you car be derailed or from any cause blockade the crossing of a steam railroad, what would be your first duty?
49. Why should a sharp lookout for passengers be at all times maintained?
50. Over what division would you instruct passengers to reach the following points, and at what street would you direct them to get off?  
To a connection with the Midland Railway, etc. (Here follows list of various intersections.—Editor.)

### MOTORMEN.

1. Having been assigned a car by the foreman of your division, what should be your first duty before taking the same out of the shed?
2. Who is supposed to have charge of the car?
3. What are your duties as motorman from the time you take charge of the car until the time you turn the same in, or deliver the car to your relief man?
4. What are your duties with reference to running over railroad crossings, frogs and switches?
5. How would you cross a railroad crossing, cross-over, frogs and switches ("with the brake set or released")?
6. What are your duties with reference to handling your car down grade?
7. In running through water to what advantage should motors be operated?
8. What are your duties in case your car gets beyond your control in going down a grade?
9. In case your car wheels slip in making a grade, what method should you apply to obviate same?
10. What are your duties in case power is shut off respecting starting up?
11. Under what circumstances are you permitted to reverse your motors?
12. In case it becomes necessary to reverse the motors, what is your first duty?
13. In what manner would you replace a fuse?
14. In case a second fuse blows in succession, what is your duty?
15. If a commutator acts badly, or other electrical troubles present themselves and either motor becomes uncontrollable, what means would you take to ascertain or locate same?
16. What are your duties with respect to occupation of your time while the car is on the stand?
17. What would you do in case your controller becomes unmanageable with the current on and set, and not being able to turn cylinder in a backward or forward position?
18. Where are the contact switches located for the purpose of cutting out motors on various types of motors?
19. To what extent is the motorman responsible for the operation of the car?
20. Under what circumstances are you permitted to pass persons desiring to board your car?
21. In passing persons desiring to board your car, what is your duty?
22. When approaching a car on opposite track that has been brought to a stop, what is your duty?
23. Why should you reduce the speed of car on approaching a switch point?
24. Why should the car clear the cross street before bringing the same to a stop?
25. Should your car be derailed or from any cause blockade the crossing of a steam railroad, what would be your first duty?
26. Why should you ring the gong when a vehicle is ahead of your car and alongside of the track?
27. What do you consider the most economical method of operating the controller switch handle?
28. Explain the path of the current from the time of leaving the generator at the power house to its return thereto?

29. Why should the trolley never be pulled down whilst the current is applied?
30. Under what circumstances would you operate your car faster than time points named on time table?
31. In what condition must your car be left in the car shed?
32. What is your duty should you find the trolley wire down?
33. Do you consider it more important to get away as quickly as possible in the event of accidents in order to maintain your car on time, or to remain and render all assistance possible?
34. Before bringing the car to a stop on up grade with a slippery rail, when would you begin dropping sand?
35. Before making stop on slippery rail, how should sand be used to prevent flat wheels?
36. Should sand be used on a dry rail?
37. Should sand be used on a clean wet rail?
38. Can a car be brought to a stop in the same distance under all conditions of the rail?
- 38A. In what distance would you bring your car to a stop on a level, or slightly down grade, car being operated at rate of 10 miles per hour, condition of track dry, and clean rail?
39. What is your duty with respect to the rail ahead of your car?
40. In case a car does not start after stopping on a dirty rail, what means would you take in overcoming same?
41. In what position should your controller handle be with respect to the motors, running down grade?
42. If any electrical trouble presents itself with the motors and becomes uncontrollable from the controllers, what effort would you put forth in checking same?
43. In what manner should you handle your controller in building up the motors to full speed?
44. What are your duties with reference to brakes before bringing your car to a dead stop?
45. What is your duty to avoid further destruction when a ring of fire presents itself passing around a commutator?
46. Name the two chief requirements of motormen?
47. Why should a sharp lookout be at all times maintained on the rail when the car is in motion?
48. What tools and appliances are motormen to have on the car at all times?
49. What are the bell signals?
50. Why are motormen and conductors not allowed to enter a car in the car shed, other than the car assigned to them?

## TWO PENNSYLVANIA DECISIONS.

Two cases in which the Philadelphia & Bristol Railway Company, an electric road, was defendant, were decided by Judge Yerkes in the lower court of Bucks county, Pa., in November last, which will doubtless be of interest.

In one, the plaintiff was a property owner who had given notice, to the company, of his opposition to the road, and had received assurances from the company that it would not build upon his side of the highway. The track was, however, laid there and the company sought to prevent its removal on the ground that the plaintiff in the present suit had stood by and permitted the improvement. The court held that it was no want of diligence that the plaintiff had not taken steps to secure an injunction, because the assurance of the company that such a step would not be necessary had not been withdrawn. A perpetual injunction was granted and the tracks ordered removed.

In the second case the plaintiffs were the owner of the life estate in a piece of abutting property, and the trustee for the reversioners. It was claimed that as the deed of trust expressly prohibited the trustee from incumbering the fee, the consent to building the road was void. The court held that a passenger railway upon a public highway in the country over the land of another is an incumbrance on the fee, and that therefore the plaintiffs had no power to grant a license to build. But it was claimed in behalf of the company that the plaintiffs by their laches had surrendered to the defendant the right to maintain its railway. The company had intended building on the other side of the highway, but an injunction obtained by the Pennsylvania Railroad removed all probability of that, and before the restraining order was rescinded the company entered upon the plaintiff's land, but was unable to complete the road before being served with a writ.

It appears that the defendant, by reason of inability to pass over a portion of the intended route, will not be able to complete the line as located. The supreme court of Pennsylvania has held that when the lack of consent by a municipality or quasi municipal division prevents the building of a road as located, the company cannot lawfully build distinct roads. In a former case Judge Yerkes declined to take the position that the company could not build because it lacked the consent of a single landholder, but in this decision says that he has grave doubts as to the correctness of this.

But such a failure is a warrant for those who have consented to withdraw. In concluding the opinion says: "Conceding, then, that there was power to grant the license, the written consent having expired by its own limit and there being no evidence even on the part of the defense of a renewal in writing and for a consideration, in view of the refusal to renew, it is difficult to comprehend by what authority the defendant occupies the land of the plaintiffs, provided the latter complained with sufficient promptitude, which I think they did. For these several reasons the preliminary injunction will be continued and made perpetual, and the defendant will be commanded to remove the incumbrance from plaintiff's land."

## THE CHEAPENING OF STEEL.

The first steel rails made in the United States were of Bessemer steel and rolled in 1867; they sold for \$160 per ton. By 1871 the price had fallen to \$102 per ton, and by 1873 to \$90. The production of Bessemer steel in America was insignificant in amount in the early seventies, in 1876 the annual product had reached 500,000 tons and increased each year until 1879, when began a race with England on the output of Bessemer steel. The American output exceeded the English for the first time in 1884, and each year since then the lead has been increased until in 1895 the American output was three times the English. In the production of open-hearth steel England has heretofore been greatly in the lead of the United States, but for the last three years our output of open-hearth steel has been increasing at a more rapid rate, the indications being that we shall soon overtake and pass England in this product, also.

Up until 1887 the steel rails rolled in America absorbed more than two-thirds of all the steel manufactured; since then there has been a gradual decrease in the rail output, so that now it is about what it was 15 years ago, and is but one-quarter of the total steel produced.

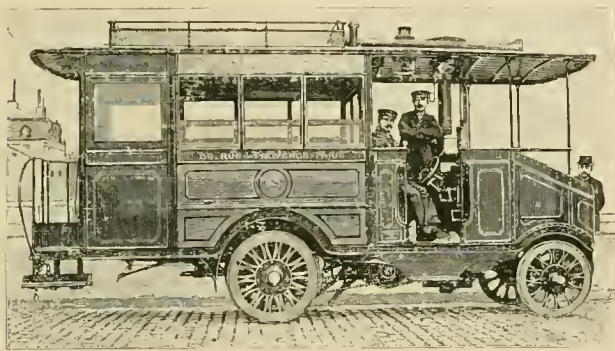
The factors leading to the fall in the price of rails from \$90 in 1873, to less than \$30 (\$17 was the price reached for a short time in the spring of 1897), have been the substitution of machinery for hand labor, the reduction of freight rates, and the working of mines containing superior grades of ores. The one thing above others is said to be the use of the Lake Superior ores.

The Board of Aldermen of New York has been temporarily enjoined from granting a permanent franchise to the 42d Street, Manhattanville & St. Nicholas Avenue Railway Company, and restrained from passing an ordinance granting franchises for more than 25 years. The charter of Greater New York forbids any franchise for the use of the streets being given for more than 25 years.



THE SCOTTE ROAD MOTOR.

During the past few months there have been many references in our foreign exchanges to the competitive trial of heavy-weight vehicles driven by other than animal power which has been conducted under the auspices of the Automobile Club of France. It is thought that a power diligence line might be made to pay where a light railway line would fail, and the government also is interested from



SCOTTE OMNIBUS.

a military point of view; at the late competition was a committee appointed by the Minister of War with directions to report on the probable value of such vehicles for the transportation of supplies and troops, the removal of wounded, etc.

The competition was for vehicles designed especially for the transport of passengers and personal baggage (the minimum being fixed at 10 persons and 700 lbs. of baggage), those for freight only, and those for passengers and freight (the minimum weight of freight for this class being 2,200 lbs.). Three different routes were selected, which each competitor had to traverse in turn. The grades on some were severe, being as much as 14 per cent; one route was 25 miles long, of which 6.8 miles was over paved roads; a second of 28 miles had 3.5 miles paved; and a third 41 miles had 6.8 miles of paving. This class of road surfaced with the heavy rounded blocks, so common in the suburbs of Paris and other Continental towns, is very destructive to ordinary carriages, and should be peculiarly trying to self-propelled vehicles. As each of the competitors traversed all the routes twice, the total run was 190 miles.

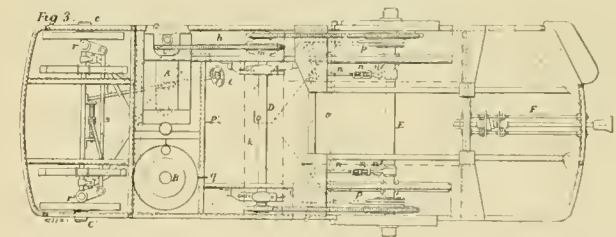
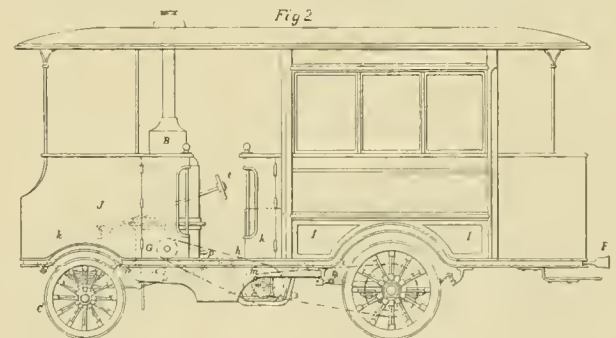
Fig. 1 shows the Scotte motor car, one of the competing steam-driven vehicles which gave excellent results. The motor car had four places, and hauled a vehicle of 18 seats and a baggage car holding over a ton. The steam engine on the motor car was of 16 h. p.; the mean speeds attained on the three routes were 4.3 and 4.7, 5.6 and 6.1, and 4.3 and 5.0 miles per hour. For freight service there was a Scotte train consisting of a locomotive weighing 5,600 lbs. which drew a wagon weighing 20,000 lbs. loaded, and made a speed of from 3.2 to 3.7 miles per hour. The Scotte omnibus, holding 12 passengers with their baggage, a total of 9,000 lbs., and drawn by the 16-h. p. motor car made 9.3 miles on a level, and the average speeds over the three routes varied from 4.5 to 6.1 miles per hour.

The steam omnibus has developed into what may be considered a standard type. The line drawings for which we are indebted to Engineering, London, show the ar-

rangements. The motor car empty weighs 9,200 lbs. It is 17 ft. long and 5 ft. 11 in. wide. The coach body at the rear holds eight persons, and there is standing room on the platform for six more. In Fig. 3, A is the engine and B the boiler. The boiler is a vertical tubular one known as the Scotte, a variation of the old Field boiler, and carries steam at 170 lbs. per sq. in. The engine is vertical with two cylinders, each 4.52x4.72 in. The normal speed is 400 strokes per minute, which with the cut-off at three-quarters of the stroke gives 25 h. p.

The axles of the front wheels are mounted on vertical pins at the ends of a transverse bearer, attached to the main frame, and their movements about the pins are regulated by connecting rods so that both wheels take the same angle. The reversing wheel is shown at t. Motion is transmitted from the motor to the rear wheels through their axle E, by the toothed gearing of the speed-changing device; by the steel chain h driving the differential shaft D; and by the chains i, i. Water is carried in tanks, I, I, placed under the seats and floor of the cab, which holds about 150 gallons. Fuel is stored in the box, J, with a capacity of 14 cu. ft. The trailing car for passengers is 14 ft. 9 in. long, with a capacity for 24 persons—12 seats and 12 standing places.

There has been a regular service of Scotte trains for a year past between Courbevoie and Colombes, near Paris. Quite recently a Scotte train was placed in service between St. Germain-en-Laye and Ecqueville, a distance of 3.3



ELEVATION AND SECTIONAL PLAN.

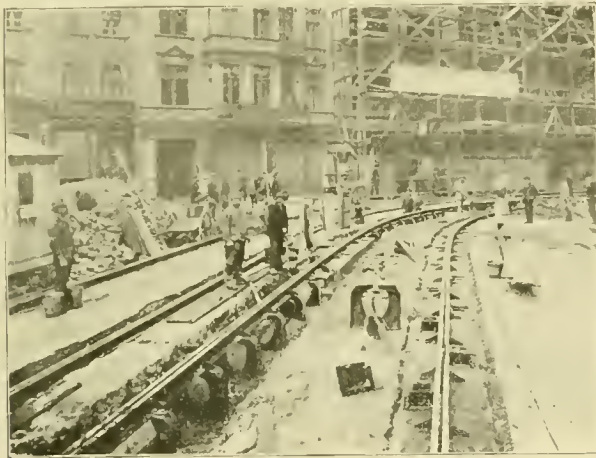
miles. The running time was fixed at 95 minutes, including 16 stops, making the necessary speed about 9.3 miles per hour.

Various tests have been made with most satisfactory results. The car climbed a 6 per cent grade on a road newly laid with broken stone, and has mounted a 9 per cent. grade on a better road.

At 10 p. m. on December 26 a trolley car on the lines of the Schuylkill Valley Traction Company was held up by four highwaymen near Swedeland. The conductor was shot and killed on refusing to surrender his money; four women who were passengers were not molested.

### CONDUIT CONSTRUCTION IN BERLIN.

The electric line which is being constructed from Behrenstrasse, a city district to the south of the river Spree, and Treptow, a suburb, is partly of the conduit system. The total length of the single track is 11 miles and  $1\frac{1}{3}$  miles in the city of Berlin where the trolley is not permitted. The illustration from the Railway World, gives a good idea of the form and manner of construction of the conduit. The cast iron yokes are set 4 ft. apart under the inner rails. Boards are placed around the yokes and cement concrete rammed about them. This bed of concrete is carried 30 in.



CONDUIT CONSTRUCTION IN BERLIN.

below the rail level and the conduit itself is an oval 14 in. wide and 18 in. deep.

The rails are not used for a return as the positive and negative conductors are carried in the conduit. These consist of two inverted T-irons insulated and supported in the conduit to either side of the center so that they can be reached only by the contact shoe. The conductors are supported every 5 ft. from insulators fastened to cast iron extensions to the rail bases. The contact shoe or plough is the same type as that at Budapest and is so formed that when the trolley is used it is automatically drawn out of the conduit. The feeders are armoured cables laid underground. The current is supplied from one of the Berlin city lighting stations.

### COPPER FOR STREET RAILWAYS.

The copper lines which radiate from the street railway power station are analagous to the arteries passing from the heart to every extremity of the human body. Over these wires is transmitted the current which gives the power for every movement. Without copper the trolley system, and in fact all electrical industries would be impossible. It seems providential that within the last score of years since electricity has taken such a prominent part in industrial progress, great deposits of copper should have been discovered and worked, resulting in a great decrease in the price of the metal.

Copper is almost as widely distributed as iron and was probably the first metal known and used in primitive times. Its malleability, ductility and tenacity make it an easy metal

to work into any form or implement. If exposed to moisture a green carbonate will form on the surface but it is not affected in a dry atmosphere. It is a little heavier than iron, the relative weights being as 8.95 to 7.25 and its conductivity is six times that of iron. Copper unites with facility with almost all the other metals but the principal commercial alloys are brass, bronze, German silver and aluminum bronzes.

Copper occurs in the metallic state in nature as well as in combination with oxygen and sulphur. The first extensive deposits came from the Island of Cyprus, from which the present name is corrupted. Later Spain and Portugal produced the metal in large quantities, the Romans and Phoenicians worked the mines in early times, and they are still very rich. England, Germany, France, and Scandinavia possessed mines of considerable magnitude. In the new world the Chili mines were the first to be extensively operated and were for a time the chief source of supply, the production in 1876, being 52,308 tons but has since gradually declined. Vermont, Tennessee and several other states in the Appalachian range produced some copper early in the century. In 1763 Alexander Henry, an Englishman, discovered deposits of ore on the south shore of Lake Superior and commenced mining operations on a small scale, but he was unsuccessful. Not until 1844 were the rich ore beds in the northern peninsula of Michigan worked with profit. The copper here was found in its native state, which, with the exception of small quantities in Peru and Bolivia, is the only copper not derived from sulphuretted or oxidized ores. This copper supplies the grade of metal with the highest conductivity, owing to its natural purity. Silver and iron are the only foreign metals in the lake copper but they are in very small quantities. This ore is treated by the pyrometallurgical or dry method which consists of the ordinary smelting process.

Other kinds of ore are treated in the hydro-metallurgical or wet method and others by the electrolytic process. The electrolytic copper is not so pure as the lake copper as in spite of every precaution in refining there remain small quantities of bismuth, antimony, arsenic, tellurium and selenium. A small per cent of impurity is very detrimental to the conductivity of the metal. The great increase in the world's supply of copper is largely due to the enormous production of electrolytic copper in the United States. Previous to 1890 there was little of this work done in this country, the ores being shipped to Europe for refining. The bi-products of gold and silver made this work very profitable and now that foreign refiners have lost the American trade beyond hope of recovery they are looking to the recently discovered copper mines in New Zealand and Tasmania for a return of prosperity.

In Montana and Arizona the production has increased by leaps and bounds. The Anaconda mines in Montana yielded 132,364,198 lbs. of copper the company's last fiscal year. The total product of these mines has been 488,753 tons of copper besides 35,584,067 oz. of silver and 118,638 oz. of gold. The ores have 4.5 per cent of copper and 4 oz. of silver to the ton. The cost of placing the copper on the market is 9.75 cents per lb. but the by-products in gold and silver are so great that last year the profits were \$5,136,048.

The electrolytic refining plant of this company is very interesting and is the largest in the world. To supply current for the work one 400-h. p. compound engine, one 300 h. p. and



two triple expansion engines, of 900 h. p. each, drive seven Westinghouse generators with a total capacity of 1,780 k. w. In the refinery there are six systems of 200 cells each, and they have an ultimate capacity of 210 tons of electrolytic copper per 24 hours. The process consists in passing a current through a solution of copper sulphate, the crude copper being the anode of the cell and the refined copper being deposited on the cathode. The impurities of the raw copper collect as a precipitate in the bottom of the cell. This slime is carefully preserved as the valuable by-products are in it.

An overhead trolley to load and unload the copper is above the cells and beneath them is a 20-in. railway used to convey the slime to the silver mill. Railroad cars transport the copper to the refinery. The copper pigs are picked up by the cranes and set in the cells, and cathodes to correspond are put in place. The tanks are then filled with liquid and the current turned on. When the process is complete the cathodes and anodes are removed, the liquid drained off and the slime washed out. The cost is .31 cent per lb. of copper. This slime or "silver mud" is boiled in acid to remove the copper, arsenic and antimony, and is then washed and dried in pans. It is fed into a furnace and ingots of silver poured. In this way 350,000 oz. of silver and 1,500 oz. of gold are obtained per month. There are 120 men employed in the work and their wages average \$3.00 a day.

The Spanish mines have ore with about 3 per cent of copper and it costs 7.44 cents per lb. to place it on the market. Sulphur is the profitable by-product. The Arizona mines produce 60,000,000 lbs. of copper per year, gold and silver being the by-products.

The Michigan mines are the only ones not having any by-product, the copper being in its native state; it is freed from its impurities by smelting. In the Calumet and Hecla mines some of the veins are 13 to 14 ft. in thickness and have been followed for 5,000 ft. below the surface. The production is 4,000 tons of ore per day, and from this 92,475,595 lbs. of copper was reduced last year. With one exception this has been the most profitable mining property in the world, as \$50,850,000 have been paid in dividends.

From these three great mining districts in the United States has come the increase in the world's supply of copper. From the table below it will be seen that nearly 55 per cent of the copper is produced in the United States. The price of copper has gradually declined, the second table showing the average market quotations for the respective years.

Production in tons, 1896:	Price in cents per lb.:	
United States.....	203,893	1870—35
Spain and Portugal....	53,325	1880—20
Chili.....	23,500	1890—15.75
Japan.....	21,000	1891—12.63
Germany.....	20,065	1892—11.5
Mexico.....	11,150	1893—10.75
Australia.....	10,000	1894—9.5
South Africa.....	7,450	1895—10.75
All others.....	21,825	1896—10.87
Total.....	373,208	

For the past year or two the home consumption has somewhat decreased, but the foreign demand has augmented. This demand has been occasioned by the construction of street railways in Europe, and for war material. Copper is like gold and silver in one particular, that is, it is costly enough to save and for whatever purpose it is used it is

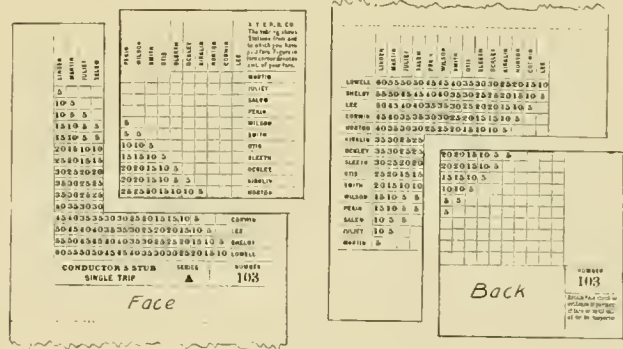
still available for a stock supply. It is not entirely worn out in any service, is not corroded, and is not thrown away. This fact was discovered when an effort was made in January, 1889, to corner the copper market. The price went up to 17¼ cents per lb. and great supplies began to accumulate from unknown sources. Especially from China and India quantities of old copper were drawn to the market by the rise in price.

For electrical purposes copper has stood alone. Silver has a slightly higher conductivity, but is too costly, and save in exceptional cases iron is too bulky for electric conductors. At present the only other metal which seems available is aluminum, which has about 60 per cent of the conductivity of copper. The increased production and the decline in the price of this metal may bring it into the field of competition. Although the supply of copper seems inexhaustible, yet it would be a great boon to electrical industry to have these two metals on the market as competitors.

## CASH FARE RECEIPT.

We illustrate herewith a simple and practical cash fare receipt for suburban and interurban roads. The face of the ticket shows in the lower left hand corner of the portion torn out, the portion given the passenger, the amount of the fare, and in the margins the stations between which he pays. On the back of the conductor's stub is shown the amount of the fare for the use of the auditor; this amount is at the bottom of the last torn column, however, and not in the corner.

The tickets are bound in books of any number desired. The book is held in the left hand, the binding edge at the



CASH FARE RECEIPT.

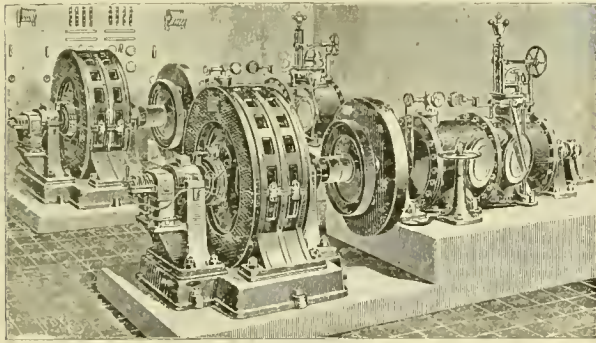
bottom and a small square of sheet metal slipped into the proper position; a quick jerk with the right hand detaches the passenger's portion of the ticket. When the ticket is properly torn the square is slipped behind the stub and serves as a book mark. At the end of the trip or run the stubs are detached along the perforated line and turned in with the cash received.

It is stated that three tickets of this type can be issued in the time required to punch and detach one ordinary duplex ticket.

The Santa Barbara Consolidated Electric Company made November 12 a benefit day for one of the conductors on the road who recently had the misfortune to lose his foot as the result of an injury received through his own carelessness. All the employes gave one days time and the company gave the gross receipts for the day.

### THE ELECTRIC PLANT AT BRIANCON, FRANCE.

Some years since the military authorities at Briançon, France, on the Italian frontier, sought to secure a supply of electricity for lighting and power purposes at the barracks and arsenals, and for the aerial cable service which is an important one at most of the mountain fortifications. The only difficulty was the expense of installation, which the department could not afford, and after asking for propositions from all who desired to bid, one by Guillon & Co. was accepted and the firm given a contract for nine years from August, 1893, by the minister of war. The income guaranteed by the military department was 15,600 fr. per



INTERIOR OF BRIANCON STATION.

annum. At about the same time the company secured a monopoly of the street lighting of the city of Briançon for 30 years, with the receipts from this source guaranteed at 4,000 fr. per annum for 10 years.

The power house is on a small stream, of which there are many in the district, and the equipment comprises two 150-h. p. Faesch & Piccard turbines and two alternators. The turbines are placed with the axles horizontal and are connected to the generators by elastic couplings. The speed is 500 r. p. m., the generators giving at this speed 100 amperes at 2,000 volts with a frequency of 50 per second. The illustration from *La Nature* shows the plant.

The financial results of the installation have been very satisfactory. The total cost was 200,000 fr.; in 1896 the receipts were 45,000 and the expenses 27,000 fr.

### FENDER STATISTICS.

The Consolidated Car Fender Company of Providence has recently issued a pamphlet of over 80 pages, descriptive of the Providence fender and the other safety devices manufactured by the company, and also giving the official statistics of all front end accidents of cars on the Consolidated, of Jersey City, and the Union Depot road, St. Louis, for two years.

As to the fender it is stated: "The Providence car fender, as now made, is the result of more than four years' study, a long series of experiments, and three years' practical use on electric cars. It embodies many ideas given us by practical railroad men, which in many cases was the result of their experimenting for months before adopting it, and placing it upon the cars of their respective roads. About 4,000 Providence fenders are in daily use in 55 cities and towns of the United States."

The accident records above mentioned are thus summarized: "The official accident records of the Consolidated Traction Company of New Jersey, and of the Union Depot Railroad Company of St. Louis, where cars are run very fast, show that 97 per cent of the persons who are struck are rescued by the Providence fender, and that 99 per cent of the rescued escape injury entirely, or receive insignificant scratches and bruises. Where both the front fender and the wheel guard have been used, no fatal accident has occurred."

### REORGANIZATION IN LINCOLN, NEB.

The Lincoln Street Railway Company, Lincoln, Neb., has been in the hands of a receiver since 1894. Since that time it has been necessary to abandon a number of lines and reduce the service on a number of others, in order for the receiver to make both ends meet. On December 17 the road was sold to Messrs. Scudder and Belcher, representing a reorganization committee chosen by the first and second mortgage bondholders. The purchase price was \$50,000; there were no other bidders.

The Lincoln Traction Company, which will now operate the road, was incorporated December 1, the capital stock being fixed at \$1,065,000. The outstanding obligations of the old company were: first mortgage bonds, \$300,000; second mortgage bonds, \$840,000; owing to the city for paving and taxes, something in excess of \$50,000.

### CHANGES IN SAN FRANCISCO.

E. P. Vining, general manager of the Market Street Railway Company, San Francisco, advises us that the company has under consideration changing the motive power on the Park & Ocean Railroad, four miles of double track, from steam to electricity, and equipping the 8th street horse line, one-half mile of double track, for electricity. It is also proposed to extend the salt water pipe line, used for condensing purposes, from the Bryant street power-house to the station at Market and Valencia streets; the distance is about one mile and the cost is estimated at \$40,000. Other changes may follow during 1898, but they are not under consideration at present.

### PROFESSIONAL WITNESS UNMASKED.

The trial of a personal injury case against the Chicago City Railway, in which the damages were laid at \$50,000, was the occasion of the exposure of Cleveland G. Arnold, one of the witnesses for the plaintiff, as a professional. On cross examination he admitted writing letters, which were offered in evidence, addressed to the Chicago City Company, in which he stated that he was the only witness to the accident, that his evidence was necessary to the plaintiff's case, and that he desired an interview as soon as possible, "as no doubt it will be to our mutual advantage."

In a second letter he offered his services for "a small consideration." He also stated that he was receiving \$2.50 per day from the People's Casualty Claim Adjusting Company, which was handling the case.

Arnold also confessed to having served a term of six months in the penitentiary for violations of the postal laws in connection with a matrimonial agency. In default of \$500 bail the witness went to jail and will answer to the charge of contempt after the conclusion of the case.



## STREET RAILWAY LAW.

EDITED BY FRANK HUMBOLDT CLARK, ATTORNEY AT LAW, CHICAGO.

*Condemnation Proceedings by one Street Railway Company  
Against Another.*

One street railroad company can not maintain condemnation proceedings against another to acquire the use of a portion of its road in the street until it has first obtained the consent of the property owners and local authorities to use the street.

Consent given by the local authorities and property owners to one company to operate its road in the street is not sufficient to authorize another company to come into the street, notwithstanding the new company is to use the same tracks and appliances as the old one in operating its cars.

Yann, J., in the opinion of the court says:

If the consent of the local authorities or of the abutting owners is required to enable the appellant to extend or operate its road through Broadway, under the circumstances, this proceeding can not be maintained until the requisite consent has been obtained. If it is required at all, it must be had before the proceeding is begun, for the statute in providing that the consent "shall have been first obtained" makes it a condition precedent. As said by this court, when construing a similar statute under somewhat similar circumstances: "Sufficient vitality and strength to go on with and construct a railroad do not exist \* \* \* until infused by the consents of the local authorities and property owners." (Matter of application of Rochester, etc., Railroad, 123 N. Y., 351, 358.) It is, however, insisted that the appellant does not seek to build a railroad through Broadway, but to acquire the right to use a road already built after consent had been duly obtained from all sources required.

It is true that the appellant does not intend to build a railroad through Broadway in the sense of laying a track there, but it does intend to "extend and operate" its railroad by so using the tracks of the respondent as to unite the two sections of its own road. Tracks alone do not constitute a railroad within the meaning of the statute which declares that a railroad shall not be "built, extended or operated" until certain preliminaries have been complied with. Cars and other appliances are required in order to make or operate a railroad. If the appellant shall finally succeed in acquiring the right to run its cars for a short distance on the respondent's tracks, it will still be operating its own railroad, not that of another company, over that part of its route as well as any other. It clearly would not be operating the respondent's railroad, but using a portion of the tracks of the respondent to operate its own railroad. Two different companies can not operate the same railroad at the same time, although both may use the same track in part to operate their respective roads.

When the statute provides that "any street surface railroad company may use the tracks of another street surface railroad company" upon certain conditions, permission "to use the tracks" implies use for the purpose of operating its cars thereon. Manifestly no other use is intended. A railroad is none the less in operation between two points, because it runs its cars for a part of the way over the tracks of another road. When a railroad corporation acquires the right to run its cars over a street, whether upon its own track or that of another, that right becomes a part of the railroad, and in exercising that right the corporation operates its own road. The operation of a railroad includes the running of cars; and when a company runs its own cars, receives its own passengers and collects its own fares over a continuous route of four miles, and all the trackage be-

longs to it except a connecting link of a few hundred feet in the middle, which it acquires the right to use through the power of eminent domain, we think it is to be regarded as operating its own railroad over the entire route, within the meaning of the Constitution and the statute. The prohibition is in the disjunctive, and is directed against operation the same as it is against construction.

It is further insisted that where one company has the consent of both local authorities and abutting owners to build and operate a railroad through a street, no further consent from either of those sources is necessary to enable a second company to use the tracks of the first, and hence that neither the Constitution nor the statute applies to the case in hand.

The consent required is not simply to the laying of the tracks, but also to the operation of the road. When the municipal authorities consented that the respondent might operate its road through Broadway, they did not consent that another company might operate a distinct and independent line through that street. The operation of one railroad might cause so slight an interference with the use of the street as not to seriously impair its usefulness, whereas, if two or more railroads were permitted to operate their lines through the street it might virtually destroy it for the ordinary purposes of a highway.

The danger of crossing at grade steam surface railroads, of which there are two running across the strip in question, would be greatly increased by the traffic of several street railroads, which shows the necessity of keeping the subject thoroughly under the control of the public authorities by conservative legislation and conservative construction of that legislation. So an abutting owner might be willing to permit one company to operate its line through the street in front of his property, which would involve the passage of but three or four cars an hour, but not be willing that several companies should have that privilege, which might involve the passage of a car every two minutes. It is not the laying of tracks but the running of cars that constitutes the chief burden both upon the street and the property of the abutting owners. Consent to the burden of one road should, in reason, be limited to that road with whatever increase of business it may have, but should not be extended to as many roads as can crowd their cars into operation upon the street. It would be an unreasonable construction to hold that this is what the public authorities or the private citizens intend when they consent to the building and operation of a street railroad.

Instead of an advantage to the public, or to those owning property on the street, which is the inducement to obtain consent, it might result in a heavy and unexpected burden upon both, without any power to prevent it, and yet with no intention to consent to it. It would be a perversion of the consent given by extending it far beyond the intention of the parties. The object of the statute is to protect the public against injury to the streets, without the consent of their representatives, and also to protect the property of the citizen against injury without his personal consent or the consent of a majority of the abutting owners, or where the refusal to consent is unreasonable, the order of the Appellate Division of the Supreme Court. The consent thus

required is of such importance as to be imbedded in the Constitution itself, not in the interest of railroad corporations, but of private and public rights.

The statute, however, goes a step farther than the Constitution, by providing, through Section 102 of the Railroad Law, additional protection to the public by prohibiting a second company from laying a track in a street already occupied by the track of another company, and thus incidentally protecting the latter from competition on the same street without compensation. Sections 91 and 102 relate to the same general subject, and should be construed together. The latter does not provide an alternative right, but is an additional requirement to regulate the construction and operation of street railroads so that the public interests may be promoted and private rights protected. (In re 34th St. R. R. Co., 102 N. Y., 343.) Construed as an alternate provision, it would be in violation of the Constitution, for it would authorize the operation, if not the construction, of a street railroad without the consents required by that instrument. Even if the old road should consent, under Section 102, the new road could neither extend nor operate without the consents required by Section 91.

We agree with the reasoning of the learned Appellate Division in this case, and should have adopted their opinion as our own had it not been silent upon the question as to the necessity of consent on the part of property owners. In order to avert further litigation in this as well as in other cases that may arise, we have deemed it our duty to express our views upon that subject also.

We think that when consent is given either in behalf of the public, or the abutting owners, to one company, it is for its own use and not for the use of an indefinite number of other companies, regardless of the interests of the city or of the owners of property on the street.

(New York Court of Appeals. The Colonial City Traction Co. vs. The Kingston City Railroad Co., 30 Chicago Legal News, 73.)

*Injury to Person alighting from Car—Duty of Railway Company—Attempting to Bribe Jurors.*

Appellee was injured while alighting from one of appellant's horse cars, and brought suit for damages against appellant, claiming that he was injured by the negligence of appellant's servants.

The appellant having stopped its car, the appellee was not thereafter bound to notify the appellant that he wished to get off and take his children off the car; but the appellant was bound to exercise the greatest care, to take notice of what the appellee was doing: Chicago W. D. Ry. Co. v. Mills, 105 Ill., 63, 68, 72.

When an ordinary steam railway train, moving and stopping for the reception and discharge of passengers only at regular stations, stops at a place not designated for the reception or discharge of passengers, it is perhaps not the duty of the carrier to keep watch of the movements of the passengers who may see fit to get off at such place; but in respect to street cars in a city, the rule, because of the practice of the people and the permission of the carriers, is different. The duty of a common carrier is that it should exercise the highest degree of care, skill and diligence for the safety of its passengers that it is practicable and consistent with the efficient use and operation of its cars: R. R. Co. v. Arnol, 144 Ill., 271, and cases cited; W. C. St. R. R. Co. v. Martin, 47 App., 615; N. C. St. R. R. Co. v. Wixam, 51 App., 312.

After the jury in the court below had rendered its verdict in this cause, the court publicly announced in the court room that two of the jurors had been corruptly approached and offered a bribe by some one, unknown, to bring in a verdict for the defendant, this being communicated to the court by said jurors while the trial was in progress. This public announcement after the verdict was the first knowledge of either parties or counsel in the case, of that fact. We think this was a mistaken course on the part of the trial judge. He, no doubt, was conscientious, believing it to be in the interest of justice to keep the attempted bribery secret, but we are clear this was error.

Counsel have given us no assistance on this question, by the citation of any authorities, and we have not felt it was necessary to support our views by extended reference to precedents, but are satisfied with the reason and correctness of the statement in 2 Thompson on Trials, 2560, to the effect that a corrupt attempt to influence the verdict of a jury by other means than evidence and argument in open court, on grounds of public policy, is always ground for a new trial, without reference to the merits of a case, and whether successful or not: Heffron v. Gallupre, 55 Me., 565; and Nesmith v. Clinton Fire Insurance Co., 8 Ab. Pr. Rep., 141.

The case at bar is a close one, both on the questions of care by the appellee and the negligence of appellant, and no one can say but the verdict was affected by the efforts to bribe the two jurors. The trial should certainly not have continued without a knowledge by the parties of the fact, and their consent. For errors noted the judgment will be reversed and the cause remanded.

(Appellate Court of Illinois, West Chicago Street Railway Co. v. Luka, 30 Chicago Legal News, 82.)

*Ordinance Requiring Fenders on Electric Cars—Validity of Ordinance.*

An ordinance requiring proper and suitable fenders on the front of electric cars to prevent accident, and making it unlawful to operate them in the streets without such fenders, is held to be a valid exercise of the power to regulate the use of the streets.

(Supreme Court of New Jersey, State ex rel. Cape May, etc., Ry. Co. v. Cape May, 36 Lawyer's Reports Annotated, 633.)

*Change from Horse Railway to Electric Railway—Not an Additional Servitude.*

The conversion of the existing single track horse car railway into a double electric railway under legislation and municipal authority is not an additional servitude on the street for which abutting owners are entitled to compensation.

(Supreme Court of Virginia, Reid v. Norfolk City Railway Co., 36 Lawyer's Reports Annotated, 274.)

*Exclusive Grant to Use of Streets for Street Railroad Purposes—In Excess of Powers of Municipal Corporation.*

The grant of an exclusive privilege or use of the streets for street railroad purposes is in excess of the powers of the municipal corporation under a statute providing that its consent must be obtained and that the railway shall be under such regulations and upon such terms and conditions as the municipality may prescribe.

(Supreme Court of Michigan, Detroit Citizens' Street Railway Company v. Detroit, 35 Lawyer's Reports Annotated, 859.)



**PRACTICAL OPERATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT IN THE POWER HOUSE.**

BY J. D. DE GURCHY.

(Continued from December, 1897.)

In regard to sandpapering commutators; although some require it very seldom, others will not run well without being sandpapered once a month, and, where they are run with frequent or continued overloads, even oftener. I have one multipolar 500-k. w. dynamo under my care, which has run smoothly and absolutely without repair for 14 months, but several others of the same type require sandpapering once in five or six months, with occasionally some slight repairs to the insulation between the segments, or to the brushes. Thirty sheets of sandpaper, 10x12 in., say 25 sheets of No. 2 and five sheets of No. 0, with a pressure of about 5 lbs. to the sq. in., will clean, smooth and polish a 900-segment commutator 10 in. wide and 6 ft. in diameter, with a wear of but two lbs. of copper. One light cut with a turning tool will not true up the whole surface of a commutator so large; two will invariably be found necessary, and the loss in copper would be about 50 lbs., or about the loss that would occur in two years by giving the commutator 30 sheets of sandpaper once a month, provided it should be found to require it. If the machine is well designed, the brushes set in the proper positions in relation to the field-poles, the lead adjusted to the variations in load, and all other trouble, such as loose commutator bars or short circuits in segments, attended to in time to prevent abnormal cutting, the commutator ought to run at least six months without sandpapering; turning off is almost unnecessary.

When spacing brushes on large commutators, do not do it by measuring between each set or by counting segments, for where there are 10 brush-holders it is very easy to creep  $\frac{1}{4}$  in. in a circumference of 15 ft. or more. To set brushes

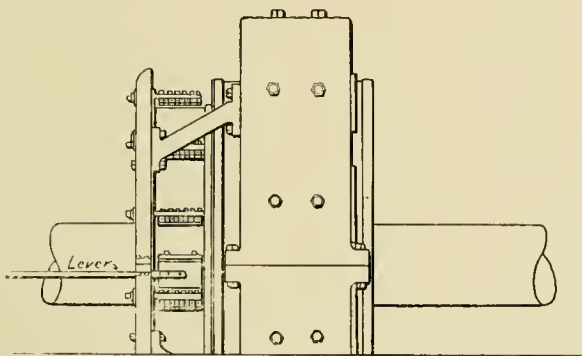
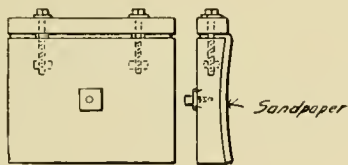


FIG. 3.—SANDPAPERING DEVICE.

in their proper positions, get the circumference of the commutator with a strip of stiff paper 1 in. wide; divide it into 10 equal parts, making each division with a thin, clear

line; then replace the paper strip and adjust the brushes to the divisions thus procured. If the brushes are properly adjusted, much unnecessary sparking and consequent wear will be obviated. Fig. 3 shows a very convenient block for use in sandpapering. Pressure can be applied by hand or by means of a pair of blocks and tackle and a lever about 5 ft. long, using the brush-holder yoke as a fulcrum about 1 ft. from the end of lever, bearing on the sandpaper block B. A strong pull upon the end of the lever will give sufficient pressure to the sandpaper bearing upon the commu-

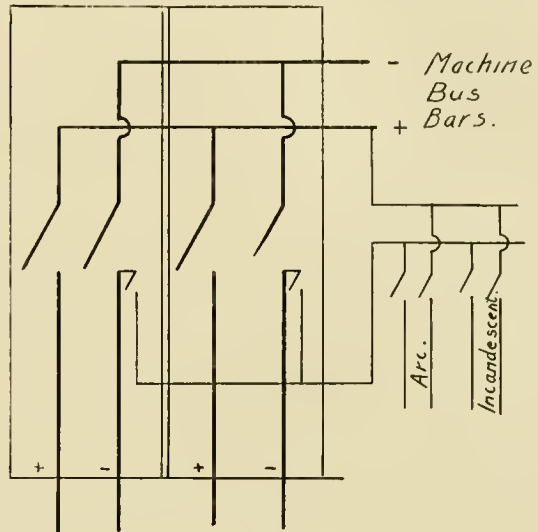


FIG. 4.

tator. A little sperm oil applied to the sandpaper immediately before using will prevent the commutator from rolling sand off the paper, insure even cutting, and keep the copper dust from flying.

There are some panel switchboards with a perfect maze of unnecessary wires, binding posts, bus bars, etc.; with wires of the greatest difference of potential near together, and positives sometimes crossed with negatives. Study the switchboard, for there may be some better way of running wires, or it may be found possible to dispense with some. If the machine panel wiring appears crowded, study out a simpler and more direct way of meeting the requirements. There may be some complicated or faulty wiring which could be simplified before some accident occurs, which might lead to a short circuit that would disable one or more machine panels.

I recall an instance where the dynamos had been thrown on the bus bars with one voltmeter plug, which method was very uncertain, owing to the loss of time in changing the plug from one panel to the other, and the necessary waiting for the needle of the voltmeter to come to rest after the contact was made. To obviate the necessity of changing the plug, two were procured and so connected that the pressure readings were found by means of a two-way pivot switch. The method proved to be all right until one of the plugs was placed in the voltmeter contacts inverted, which caused a fuse in the voltmeter circuit to blow, and the fuse block being inadequate for the high e. m. f., an arc was formed across the terminals, and owing to the crowded condition of the wiring the machine panel was practically wrecked, the system being at a standstill for 30 minutes. It is needless to say that the panel has since been changed, and also all the other machine panels in that in-

stallation, and they are now using a Weston differential voltmeter.

Machine bus bars, no matter how large, should be well insulated; then, if trouble ever occurs, there will be no heavy arcing between them. Where station lights are supplied from the power switchboard it will be found very simple, safe and convenient to connect them as shown in Fig. 4. The only change in shutting down a dynamo is in transferring the negative connection from the dynamo to be shut down to the one to be left on the line. The only possible way to get into trouble would be to close the negative light circuit switch on an idle dynamo with the equalizer in, or to leave it in on a dynamo which has been disconnected from the line. Any such mistake, of course, would be gross carelessness and wholly unnecessary.

Circuit breakers should be given considerable care to insure perfect action. The slides and plug should be kept perfectly clean and smooth, and should be adjusted to maintain a closed circuit in the magnet coils until the main contact has opened at least  $\frac{1}{2}$  in. The interior of the fibre box enclosing the secondary contact should be kept free from carbonized substances thrown off and burned against the walls by the arc, and all the connections should be tight. The main terminals, especially on the machine breakers which are sometimes obliged to carry an overload, will get very hot if allowed to become loose. The jarring of the breaker is liable to loosen the screws in the connectors of the magnet coils, and if these get very loose it will so increase the resistance of the blow-out magnetic circuit coils that the short circuit is liable to assume gigantic proportions before being broken, and might possibly arc

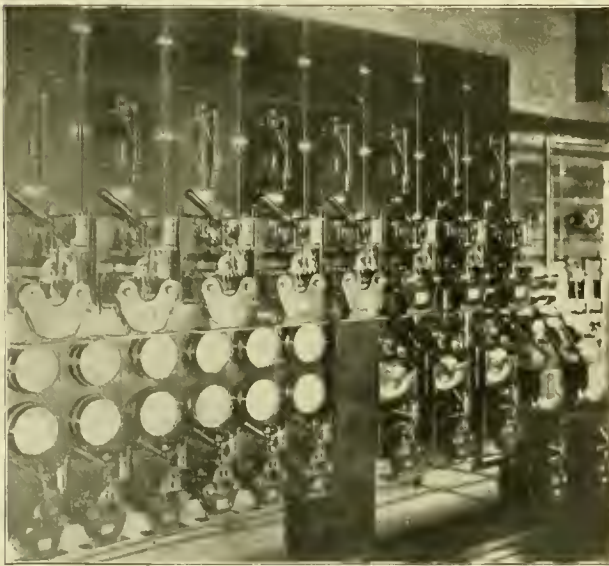


FIG. 5.—SWITCHBOARD.

at the main contacts. An off-set screwdriver should be procured for tightening these, for an ordinary screwdriver is too long to be of any practical use where the circuit breakers are arranged on panels close together.

Circuit breakers should never be opened for repairs without first being open circuited, or some other path provided for the feeder supply. To take off the front blow-out magnet plate would break the magnetic field, and although the circuit breaker would open, the destructive

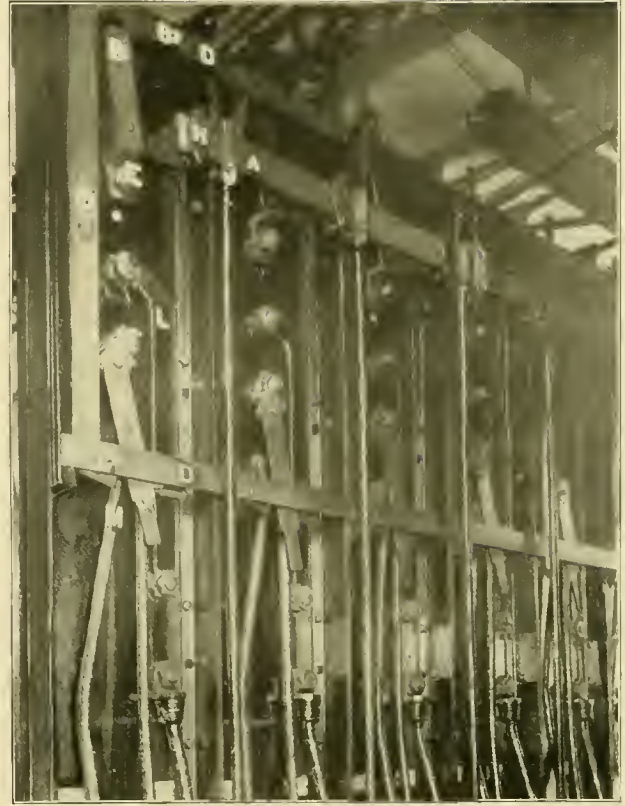


FIG. 6.—REAR OF SWITCHBOARD.

arcing would render the sliding connections and contact plug useless. If the short circuit were particularly heavy, it would open the machine circuit breakers, thereby cutting off the current supply from the lines, because the feeder circuit breaker, being without the magnetic blow-out, would continue to arc after it had opened mechanically. In the accompanying photograph, Fig. 5, will be seen an arrangement of connections and switches for cutting out any of the 16 circuit breakers for inspection or repairs, without interfering with the current supply of the feeders, and with the aid of but one spare circuit breaker. The front of each rear panel shows a circuit breaker and switch and two feeder ammeters. The panel directly in front holds a circuit breaker and switch only, the ammeter being left on the rear panel for convenience in arranging the switch contacts. The lower front panels were installed in order that a circuit breaker could be provided for each feeder without a great sacrifice of space.

Now, looking at the photograph of the rear of the feeder panels, Fig. 6, A is the main positive bus bar from which all the feeders are supplied, the connection H supplying the circuit breaker at the top of the main panel. D, D, D is an auxiliary bus bar and is connected to the main bus A by means of a spare circuit breaker. Now, with the switch E thrown to the left to connection B1, the feeder takes current from the main bus A at H through the circuit breaker to the switch jaw contact B1, which is behind but not connected to the bus D, down through the switch E to the ammeter between E and L, to the main feeder switch on the front of the panel, and out to the line. To cut out the circuit breaker connected at H the bus D is made alive by closing the spare circuit breaker. Now, the switch jaw contact B2 being connected to the auxiliary bus D and



being of the same potential as A, if the switch E is thrown to B2 the panel breaker H B1 is cut out and can be opened for repairs without opening the feeder circuit, because the switch E makes contact with the connection B2 before leaving B1. The circuit breaker on the front panel is supplied from J, the current going down to and beneath the platform to the circuit breaker and through the main feeder switch back to the jaw contact C1, through the switch F, to the lower ammeter and through the feeder M to the line. To cut out the circuit breaker on the front panel the switch F is thrown from the jaw contact C1 to contact C2, and, like the switch above, makes electrical contact with C before leaving C1. The jaw contact C1 is given rigidity by being clamped to the feeder bar L, but is not electrically connected, being well insulated with  $\frac{3}{4}$ -in. fibre.

## DISCIPLINE OF EMPLOYEES.

The Metropolitan West Side Elevated Railroad Company, of Chicago, has a system of discipline based on the percentage classification. W. E. Baker, superintendent, and A. S. Jones, superintendent of transportation, made a careful study of the subject before adopting the present system, April 1, 1895. The defects of any system of promoting men simply according to seniority of service, or of discharging them for all infractions of rules, were evident. A system was desired which would encourage the trainmen to not only do their duty, but to in every way conserve the company's interests, and one which would have an educating influence.

The following article was incorporated in the rule book:

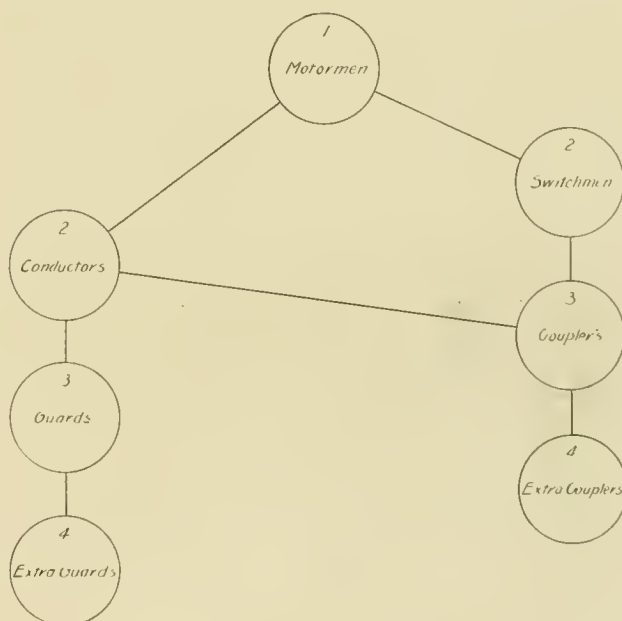
"It is the desire of this company to impress upon the mind of each person accepting service in its employ that retention in service will be based upon good deportment and strict observance of all rules and regulations. It is the aim of this company to reward such good deportment and obedience to rules and regulations by promotion from time to time from one class to another when vacancies occur, this promotion to be governed by ability and a fair percentage basis, seniority only having the preference when other qualifications are equal. Upon entrance in each class by promotion or appointment each employe will be credited with a 100 per cent mark, and for each violation of rules, in addition to the punishment of suspension from duty that may be inflicted by the head of the department, a deduction of 5 or more per cent, according to judgment of the head of department, will be made from standard. When an employe in a class has fallen below the rate of 45 per cent he will be reduced in rank to next lower class, with a 100 per cent credit rating from said time of entrance. A credit of 2 per cent per month will be placed to each employe having for that time had no reports against him for dereliction of duty."

The punishment of suspension is no longer inflicted, as it was found to bear most heavily upon the family of the offender, and if the violation did not warrant dismissal the loss of percentage was sufficient punishment. Intoxication is the only transgression which is invariably followed by dismissal.

The figure indicates diagrammatically the classes into which the trainmen are divided and the process of promotion. The motormen, having the most responsible positions, are in Class 1 and receive the highest pay. Switch-

men and conductors are in Class 2, switchmen receiving higher wages, however, than the conductors. Class 3 comprises the couplers and the guards, the former receiving higher pay. In Class 4 are the extra couplers and extra guards; no other "extras" are employed, vacancies in any class being filled from the class below. Extra guards receive the wages of guards, and extra couplers the wages of couplers, for the time that they are on duty. An extra guard is promoted to a guard, an extra coupler to a coupler, a guard to a conductor, a coupler to either a conductor or a switchman, and conductors and switchmen to motormen. Each man starts into the next higher class with a percentage of 100.

When an application is made a blank is filled out giving the previous occupation, height, weight, etc., of the applicant, and filed at the office. When an extra guard or coupler is needed, the applicant is given a physical examination and his sight tested. If everything is satisfactory the man starts in with 100 per cent at the beginning of the month next succeeding his appointment. At the first of the next month 2 per cent is added for seniority allowance to his average if he has not violated any of the rules and regulations of the company. These records are kept in the main



office on cards, and for each employe there is a complete history of his services with the company. By this means the officials have accurate information concerning every employe, and can tell almost at a glance how faithful any one has been in the performance of duty.

Whenever there is a violation of any rule, or any man has been guilty of negligence or bad judgment, the superintendent at once consults his record. If the man's record is good and nothing serious has resulted, a bulletin is posted giving a warning or reprimand. If the action calls for severer punishment a certain per cent is deducted from the man's record, and a bulletin is posted in the four trainmen's rooms giving an account of the violation and whatever advice is necessary. These bulletins, which all the trainmen see, are a large factor in educating the men in the performance of their duties. Examples of the punishments are as follows: One guard was seen flirting with some girls and not attend-

ing to his duties; his percentage was reduced by 10. A motorman ran past a danger signal; he was fined 5 per cent. A train ran one car past the station and the conductor gave the signal to back up while the passengers were passing from the cars; he was fined 5 per cent for bad judgment.

If the employes are to be punished for mistakes it is proper to reward acts of extraordinary care and good judgment. One guard was given 5 per cent for rescuing a passenger who had fallen from the station platform. It was noticed that some of the motormen were taking extra precautions to keep their cabs clean and the apparatus polished. The cars were inspected and 2 per cent was added to the percentages of the deserving motormen. A number of the conductors and motormen were very careful in keeping their uniforms brushed, their linen clean, shoes polished and preserving a tidy appearance generally, and additions of 2 and 1 per cent were made on the records of such men. Bulletins commending the good conduct of the men are also posted, and this is a great encouragement for the best service. Each motorman, at the end of his run, makes a record in a book of the condition of his motor car, and mentions any defects or needed repairs. The night men take this book and examine and repair any noted defect.

If another man is needed in any of the three upper classes the employe who has the highest percentage in the class below is selected for promotion. For motormen the incentive to make a good grade lies in the choice of trips. A complete record of all the trips, the hours of service and the time allowance, is made out, and the motorman having the highest percentage is given his choice of trips, and so on down the line, according to each man's grade. There are 322 trainmen governed by this system. The clerical work involved is not excessive, as it is systematized and attended to monthly. The orders are written by the superintendent of transportation, and his private secretary keeps the records. The towermen, dispatchers and station sellers are also under this discipline. There has been a recent proof of the effectiveness of the plan. Complaints were made by the cashier and auditor that the ticket sellers were making too many mistakes in the money and the figures on the envelopes turned in, also too much bad and mutilated money was coming into the office. The superintendent of transportation posted bulletins notifying the ticket sellers that the next three mistakes would be followed by a warning bulletin, at the fourth mistake 2 per cent would be deducted from their percentages, at the fifth mistake 5 per cent would be deducted, and subsequent errors might be followed by dismissal. This practically put a stop to the carelessness.

This system is similar in many respects to that adopted on some railroads, yet in a number of essential features it is quite different. Publicity is given to all records, names being in all cases freely mentioned, and a punishment in loss in percentage is positive and permanent. A man can never regain his original position among those fellow employes whose service has been exempt from mistakes. The officials give their unqualified indorsement to the system, for no one can question its success. The discipline is second only to that of a military organization, and the employes have been trained and educated so that they are competent and reliable in their positions. Letters complimenting the company on the neatness, precision and efficiency of its employes are constantly received at the office from patrons of the road.

## SPARKING AT THE COMMUTATOR.

In a paper before the American Institute of Electrical Engineers, Thorburn Reid discussed the cause and effects of sparking on commutators. He spoke of the following as some of the various ways in which imperfect commutation may occur and the manner in which this imperfect commutation causes injury to the commutator:

First—Suppose that the current flowing across the contact surface of the receding segment does not decrease as rapidly as the contact surface of that segment decreases. The current density then increases and is a maximum at the last part of the segment that touches the brush. More energy is thus concentrated at that point than at any other, and owing to the fact that time is required to conduct that energy to other parts of the segment that part will be raised to the highest temperature. This temperature may be high enough to melt, or even volatilize the copper of the segment, therefore when the brush leaves the segment the current continues to flow through the film of melted copper, volatilizes it and draws an arc. This arc constitutes the injurious or "vicious" spark. The removal of the volatilized copper from the receding edge gradually wears that edge away. Reduction of the contact surface thus continually increases the current density, and the arc is formed at an earlier stage of the commutation when the current to be broken is greater, and thus the spark increases in viciousness until the commutator has to be turned down before the machine will run at all.

Again, the energy developed at the receding edge of the segment may not be sufficient to melt the copper. In this case the current to be broken when the segment leaves the brush will jump across from the brush to the segment. This spark has no deleterious effect, since most of its energy is developed in the space between the segment and the receding brush, instead of being concentrated at the edge of the receding segment. This spark is of the same bluish color as that of the Ruhmkorff coil, by which it may be distinguished from the injurious spark, which is yellow.

Second—Suppose that the current flowing across the contact area of the entering segment increases more rapidly than the contact surface increases. The current density in that part of the segment then increases and more energy is concentrated at this point than at other parts of the segment, and it will accordingly be raised to a higher temperature. If this temperature is not high enough to melt the copper, no harm results and there is no spark, since the contact is not broken at that point. If, however, the temperature produced is high enough to melt the copper, the melted copper may be carried along by the brush, and the entering edge of the segment is thus gradually eaten away. This will not show by any sparking immediately, but it will eventually cause a spark to appear in the following manner: The eating away of the entering edge of the segment gradually reduces the area of the entering segment and thus increases the resistance of that segment. This delays the decrease of current in the receding segment, and the current density in both segments increases until the temperature gets high enough to produce a spark, as described in the first case of imperfect commutation. Another incidental injury that may occur is the deposition of the melted copper at the back of the segment, thus raising the surface of the segment at that point, and this, together with



the depression of the surface at the front of the segment, would cause the brush to jump and chatter, which of itself would cause deleterious sparking.

This would explain the cases where a machine runs perfectly sparkless when first set up, but after a time commences to spark, the spark increasing in intensity and deleterious effect and disappearing when the commutator surface has been turned up, only to reappear after sufficient time has elapsed. The wearing away of the front edge of the segment is hardly likely to be noticed, since no injury would be looked for until the spark appeared, and then the cutting of the back edge would be much more prominent, because that, being produced by an arc, would have a roughened appearance, while the surface of the front edge would be left smooth, by the rubbing off of the melted copper.

Third—The reversal e. m. f. may be large enough not only to reverse the current in the coil under commutation, but even to increase it beyond the value of half the brush current. In this case the extra current would flow through both segment surfaces, but owing to the fact that this current would be increasing while the receding segment was reducing its contact area, that segment would get hottest, and as soon as it reached the melting point an arc would be drawn and destructive sparking would ensue.

Perfect commutation for any particular position of the brushes can only take place at one value of the load. At heavier loads than this critical one the current is not completely reversed before the segment leaves the brush, and at lighter loads it is more than reversed. This problem may be stated a little more precisely in the following manner:

Assume that the brushes are set as far back as is consistent with sparkless running at the maximum load at which the machine is required to run sparklessly. This means that the reversal e. m. f. is just equal to the coil impedance e. m. f. at that point. Now let the load be removed gradually. The impedance e. m. f. of the coil under commutation is reduced while the reversal e. m. f. remains practically constant. The tendency is therefore for the current to be more than reversed, and this tendency increases as the load is reduced, until finally, when the load has been removed entirely, there is no current to reverse, and the reversal e. m. f. simply tends to produce a current in the coil under commutation. The production of this current is now opposed by the inductance and resistance of the coil and by the resistance of the brush contact surfaces, the contact surfaces of the two segments being in series as regards this current. If the impedance of the coil is low as compared with this contact resistance, the reversal e. m. f. would be small compared with the current times resistance drop across the contact surfaces at full load current. Therefore, the current produced by the reversal e. m. f. would be small as compared with the full load current.

We may also note here that, whereas the variation of the contact resistances aids the reversal of the current, as soon as this current becomes greater than that which flows through the armature, the excess current must pass across the contact areas of both the segments under the brush. The resistances of these two surfaces are then placed in series as regards this current, and the lowest possible resistance that these could have would be reached when the brush covers an equal surface on each segment, making the contact resistance in the path of this current equal to twice the resistance of the contact surface of either segment at

that time. The resistance of this path then starts at infinity, decreases to this minimum and goes back to infinity again.

Now examine more closely the order of events in commutation at no load. The resistance of the coil circuit first starts at infinity and rapidly decreases, while the reversal e. m. f. starts at a minimum and more slowly increases. If there were no contact resistance, the current would reach its normal full load value at about the middle of the commutation period. This of course assumes that the reversal e. m. f. is of such a magnitude as to reverse the current at full load without the aid of the varying contact resistances. In fact, the reversal e. m. f. does a very small part of the reversing at full load when the inductance is small compared with the contact resistances. The current at the middle of the commutation period would therefore be much smaller than the normal full load current, even if there were no contact resistance to limit it. Now introducing this contact resistance, which starts at infinity and decreases to a minimum, which may be several times greater than the impedance of the coil, the current must be reduced at least in the proportion of the impedance to this minimum resistance. During the rest of that period the resistance is increasing till at the end it has reached infinity again. The current, already very small, is rapidly cut down till it is too small to produce a visible spark at the break, and the commutator has not been heated up enough at any point to produce arcing.

The same principles hold in the case of machines whose brushes must be shifted, the range of sparkless commutation only being less.

There have been some machines, however, which would not run sparklessly for any position of the brushes. This is readily explained on the hypothesis of too high an impedance, for in that case the variation of the current during commutation will be mainly governed by the impedance and reversal e. m. f., instead of by the variation of the contact resistances, so that even if complete reversal is exactly attained, the current density at other parts of the commutation period does not remain constant, with the result that the total energy of commutation is increased. A large part of this energy is concentrated at the beginning and end of the commutation period, thus producing heating at the edges of the segments with its corresponding melting of the copper and arcing.

These considerations indicate two ways by which sparkless commutation may be assured. First, by increasing the brush contact resistance; and, second, by decreasing the impedance of the coil under commutation.

The limitation of the second of these conditions is merely one of economical design, lowering of the inductance below a certain point increasing the cost of the machine.

The limitation of the first condition is that of rise of temperature of the commutator. It has been shown that for perfect commutation the current density is constant and uniform throughout the whole period of commutation. Its value is found by dividing the total brush current by the contact area of the segments under a brush. This varies inversely with the brush contact area, and the energy developed therefore varies in the same proportion. The amount of commutator metal to be heated, as well as the radiating surface, also varies inversely with the current density, so that the rise of temperature probably varies nearly as the square of the current density, provided the commutation be practically perfect.

The increasing use of the carbon brush in place of the copper brush is thus explained by the fact that the contact resistance of carbon on copper per square inch is much greater than that of copper on copper. Increased resistance is obtained with the carbon brush by reducing its contact area, but this also reduces the metal to be heated in the commutator, as well as its radiating surface, so that the same amount of commutating energy will result in a much greater rise of temperature.

By taking these facts into consideration, however, and properly proportioning the contact areas and inductance, commutating machines may be designed to run as cool with copper brushes as with carbon wherever this may be desirable.

The reasoning so far has been based on the assumption of but one coil being commutated at a time. This assumption will only be true when the brush thickness is equal to or less than the width of one segment, plus twice the thickness of the insulation between segments. In practice, brushes are often made to cover a segment and a half, sometimes two segments, or even more than this without deleterious sparking. This means that the current in two or more coils is being commutated at the same time.

At first sight this appears to be an advantage since it enables us to get the same current density with less length of commutator, but the time of commutation is increased, so that while the rate of development of energy is not changed, the total amount of energy developed will vary with the time of commutation, and in addition to this the amount of metal to be heated and the radiating surface are both decreased, so that in this respect the change is rather a disadvantage than an advantage. Another important advantage is gained, however, in that the increase in the length of the commutation period decreases the reactance of the coil by decreasing its frequency of commutation, so that the ratio of impedance to contact resistance is decreased, thus tending towards more perfect commutation. This advantage is again limited by the fact that the mutual inductance of two coils commutating at the same time increases the reaction of both.

To sum up, the deleterious effects of sparking are due to excessive local heating of the commutator contact surface, causing the copper to melt, and an arc to be drawn, the segments being thus disintegrated.

The causes of deleterious sparking are either too great a departure from perfect commutation or too high a current density.

Perfect commutation can only be practically secured by making the impedance of the coil negligible as compared with the contact resistance. A comparison of the sparking constants of a large number of machines was made before this theory of commutation was evolved.

It has been found to explain many cases of sparking which had before been unexplained.

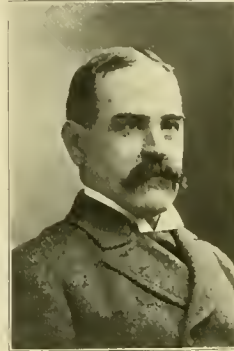
It has been found difficult to determine definite safe working constants, on account of the small number of tests that have been made to determine accurately the inductance of the coil under commutation and the effect on each other of two or more coils commutating at the same time.

At the meeting of the New Jersey State Grange of the Patrons of Husbandry resolutions were adopted favoring the repeal of the state law which prohibits street railways from carrying freight.

## ILLINOIS STATE ASSOCIATION.

In response to the call issued by W. H. Patterson, president of the Bloomington City Railway, as published in the "Review" for December, representatives of the street railways of Illinois, met at the Great Northern Hotel on January 5 and organized the Illinois Street Railway Association.

Officers were elected as follows: President, W. H. Patterson, Bloomington; vice-president, D. B. Sherwood, of the Carpenterville, Elgin City & Aurora Railway; secretary and treasurer, C. K. Minary, general manager of the Springfield Consolidated Railway Company. Also an executive committee which comprises the officers of the association, and W. L. Ferguson, general manager of the City Electric Railway, Decatur; B. F. Harris, Jr., president of the Urbana & Champaign Electric Street Railway, Champaign; W. F. Brennan, superintendent of the Chicago General Railway, and Walter Barker,



W. H. PATTERSON.

president of the Central Railway Company, Peoria. The executive committee drafted a constitution and by-laws for the association and fixed the third Wednesday in May as the date for the first regular meeting which will be held at the Great Northern Hotel in Chicago.

Sixteen roads were represented at this preliminary meeting, while President Patterson had received replies from ten other companies stating that they were heartily in sympathy with the plan for a state association and regretting their inability to send representatives to participate in the organization. The success that has attended this attempt at forming an association for Illinois is highly gratifying to Mr. Patterson, who has had the preliminary work to look after, and the more so that the subject has been more or less agitated for the past 10 years.

## RECEIVER MAKES A GOOD REPORT FOR THE CALUMET.

The Calumet Electric Street Railway, of Chicago, has made a good record during the past year, according to the report of the receiver, John C. McKeon. The earnings for the last eight months have been \$144,995 and the operating expenses \$23,970 less. The summer traffic on this road is always very heavy, and last summer was good, although the weather was unfavorable for pleasure riding; July was the best month. Among other improvements during the past year have been the addition of three boilers, a large car barn and 10 motor equipments. The property is in good condition and the indications now are that in another year the road will earn the interest on its bonds.

A jury at Ann Arbor, Mich., awarded \$7,000 to John Shadford, who sued the street railway company for injuries sustained from falling while repairing a trolley wire. A former trial resulted in a verdict for \$4,500.



VESTIBULES IN OMAHA.

The legislature of Nebraska last winter passed a bill making it unlawful for any railway company to operate cars, propelled by steam, cable or electricity, between November

ished by a fine of \$100, and each day's operation is considered a separate offense. It is provided, however, that this act will not apply to trail cars.

The Omaha Street Railway Company had 90 motor cars which came under the provisions of this act, and it was necessary to design a neat vestibule of moderate cost. The three illustrations, furnished by D. H. Goodrich, secretary of the company, represent the standard form of vestibule adopted. The best materials were used throughout in the construction, and the cost, including all necessary changes in the car, was \$78 per vestibule. It will be noticed that only one end is protected. This is made possible by the fact that all the terminals of the lines are Y's; the equipping of the terminals not already provided with Y's involved an extra expense of \$5,000.

WHAT THEY DID ON CHRISTMAS.

The Columbus (O.) Street Railway provided Christmas dinners for its employes. The married men, 300 in number, were presented with turkeys, the weight being tempered to the size of the family; the unmarried men received \$1 each.

The Consolidated at Bay City, Mich., departed from its usual custom of giving turkeys to the employes on Christmas, and instead presented the wives of the men with books of complimentary tickets. Christmas was made a short day, the car service not commencing until 7 o'clock, and by a special order the men were allowed to smoke while on duty.

C. C. Howell, manager of the Knoxville Street Railway, took advantage of the season to promulgate a new rule to the effect that on the first of January and on the first of July of each year the company will present a suit of clothes to those motormen who have not cost the company more than \$5 because of accidents during the preceding six months. On Christmas eve the motormen who had not cost more than \$10 for accidents since Mr. Howell took charge, August, 1895, received their first suits. A similar recognition of good service on the part of the conductors is contemplated, but exactly what has not been decided.




FRONT VIEW.

1 and April 1, without the platforms being enclosed by a vestibule made of wood, iron and glass. The vestibule must be so constructed that it will not interfere with or obstruct the vision of the operator. Violations of this act are pun-



SHOWING VESTIBULE ADOPTED BY OMAHA STREET RAILWAY.



# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

When the power house of the Capital Traction Company, of Washington, was destroyed by fire on the night of September 20, last, there was a large amount of coal, several hundred tons, on hand. At the end of three months the pile of coal was still slowly burning; no attempt was made to extinguish the fire as the cost of doing so would exceed the value of the coal that could be saved, and there was no danger to surrounding property in letting it burn. During the day the only indication of the fire is a slight smoke rising from the pile, but at night the flames from the burning hydrocarbons are visible. The Traction Company would gladly have given the coal to those desiring to take it away were it not for the fear that some one would be injured in working about the ruins, and sue the company for damages. Accordingly everything, save some tools and bar iron stored in the building, was sold to the contractor who is under agreement to have the site cleared by March 1. The stack will be left standing as it may be of value to the purchasers of the property, and in any event it will cost no more to remove it at a future date than at the present time.

\* \* \*

We desire to place on record the peculiar combination of circumstances leading to the partial disablement of the power station of the Metropolitan Elevated in Chicago a few weeks since. Ever since the Metropolitan trains were put in operation around the Union Loop the power station has been loaded nearly to the maximum, and a few days before the accident it was necessary to throw one engine out of service to replace a bolt under the main bearing, thus putting an overload on the three others. About midnight on Christmas a heavy load was thrown on the station which should have opened the circuit breakers; one of them did not act, however, and the increased load on the engine caused so much steam to be carried to the condenser that the pressure increased in the latter until the relief valve opened. Some of the water which escaped at the relief valve of the condenser fell on the belt driving the condenser pump and caused it to slip off; the load being thus suddenly relieved the small engine ran away, and the fly wheel burst. Until the condenser engine could be repaired the large unit was operated non-condensing. The total damage to the plant did not exceed \$300.

\* \* \*

Of all supply men, the man who has a saving device has probably the most tantalizing job, when it comes to selling. His fellow salesmen look at him with envy and say: "If I only had something that would save money instead of the supplies I now carry I'd call it a snap." But the salesman with the saving device quietly thinks to himself that the other fellow has much to learn about human nature if he has never tried selling something for saving money. One manager will say that if he bought all the saving appliances that were offered he would be running his plant for nothing. Another will be delighted with the idea, but the company treasury will be low. Another will, through ig-

norance, refuse to believe in the economy of an appliance, all experience and tests to the contrary notwithstanding. The path of the manufacturer is further not made easy by the fact that it is often difficult to make a correct estimate of the saving effected by any device because of the variable conditions under which tests must be made. This is well illustrated by the following tale of woe related by a manufacturer of condensers. He had installed a condenser on trial in a place where the water for condensing cost absolutely nothing. It did not even have to be raised to the level of the condenser, as it was used in a manufacturing process and was delivered to the condenser without any extra cost. The condenser was put in and gave a nearly perfect vacuum. Now any steam engineer worthy of the name would know that this would mean a saving of about 20 per cent if the conditions were the same before and after the condensers were installed, and that if no economy was shown something was wrong somewhere else around the plant. Nevertheless, after the condenser had been in a while the engineer sent word that he didn't want the condenser; it must be taken out. The maker expressed considerable surprise, since the vacuum was as good as could be expected with any condenser. The situation was fully but briefly explained by the engineer: "Oi knows nothin' av your vacuum, but me coal bill is the same as before." The condenser came out, and the maker has concluded that since he can't run the steam plants himself and since a saving at one place may be made up for by a leak at another when such an ignoramus is in charge, that he will hereafter guarantee nothing but the vacuum.

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### A Three-Point Boiler Suspension.

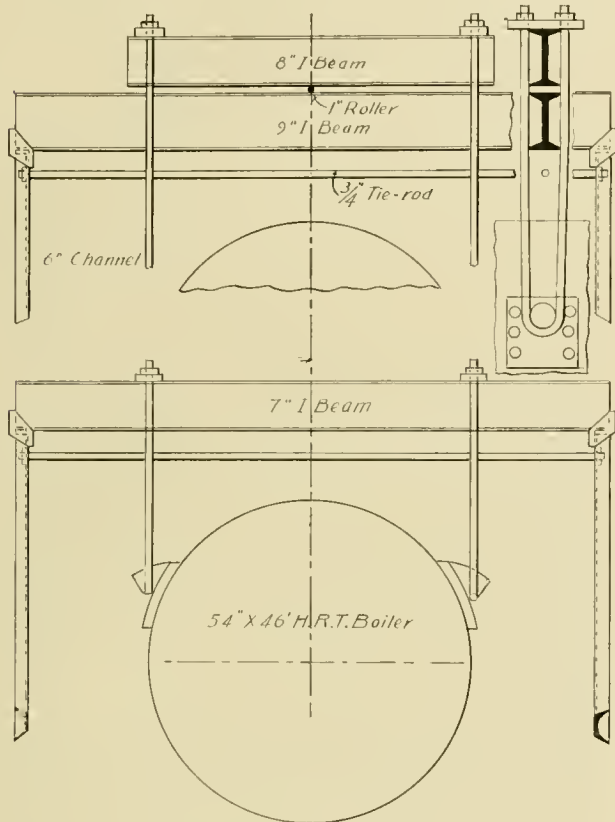
At the December meeting of the American Society of Mechanical Engineers, George W. Bissel, of the Iowa Agricultural College, presented a description of a boiler setting designed by him some time since, by which a three-point support for the boiler is secured, thereby freeing it from all stresses due to the settling of the setting; also the boiler and setting are made independent, prolonging the life of the setting and making repairs easy.

The boiler to which the setting was first applied is of the horizontal return tubular type, 54 in. in diameter and 16 ft. long. Two pairs of lugs of special design are attached to the sides of the shell above the fire, at a distance, to centers, of 3 ft. 6 in. from the ends of the shell. These lugs rest on hangers of 1-in. round iron, which are carried by nuts on wrought iron saddles cut from 3x1-in. bar iron. The saddles are carried on I-beams. At the front of the boiler one 7-in. beam is used; at the back end the saddles are supported by an 8-in. equalizing I-beam 5 ft. long, which rests on a 1-in. roller, the roller bearing on the 9-in. I-beam. The I-beams at the front and back end are supported on columns, which are 6-in. channels. Suitable castings serve as caps for the columns and sole plates for the I-beams; the



foot plates for the columns are of cast iron 12x12x $\frac{1}{2}$  in. These foot plates are set perfectly level on piers of brickwork about 2 ft. square, built independently of the boiler setting proper.

Tie-rods of  $\frac{3}{4}$ -in. round iron hold the columns in place



BISSELL BOILER SETTING.

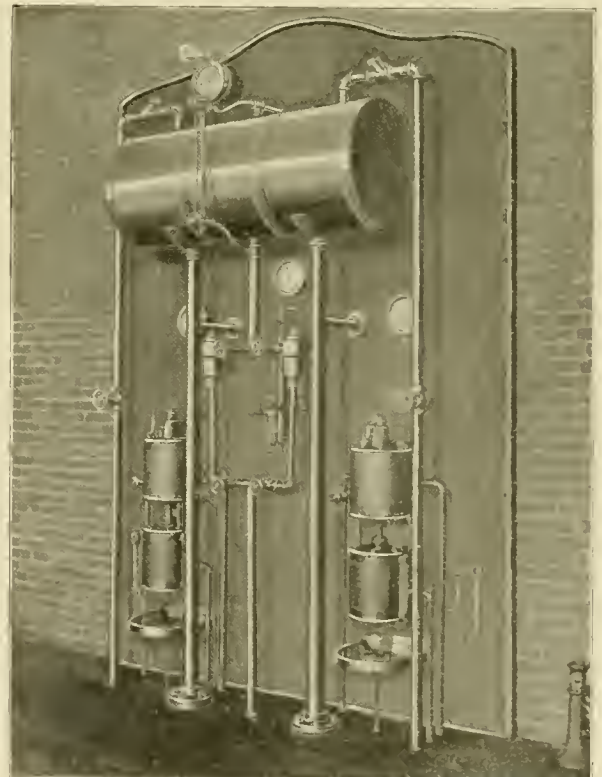
at the top, and longitudinal stability is given by setting the channels into the brickwork of the setting so that the flanges do not project but are flush with the wall.

\* \* \*

### The Q & C Oiling System.

The idea of connecting all the oil cups of a plant with a central source of supply by means of piping is an old one, but in working it out it was found that the difficulty lay in getting the oil through the piping so as to feed the bearings regularly. Many plans have been tried, feeding by gravity and under steam pressure, water pressure, or ammonia pressure, and by means of a pump. Steam and ammonia were abandoned because of their injurious effect on the oil; water pressure because of its filling the piping and because of the difficulty of getting a uniform pressure. The gravity system was the only one of the old methods which was at all satisfactory in action and the application of it was limited to those cases in which there was ample room to place the tank above the machinery, while having the whole system exposed to the same temperature. The greatest objection to this plan is that any reduction of level of the oil in the tank reduces the pressure at the cups and varies the supply; also in the case of any stoppage of the pipes the gravity system offers no ready method of clearing them of obstructions, and when the oil reaches a certain low level the cups stop feeding though there is yet considerable oil in the piping.

The use of air under pressure for driving the oil through the piping has proved to be very successful as developed by the Q & C Company, and its system has been installed in a number of the largest street railway power houses in the country. The illustration gives a very good idea of the arrangement of pumps, tank, filters, etc. The tank shown, called the "fountainhead" or central point of distribution, is of from 40 to 80 gallons capacity, and is erected on two pipe standards 8 ft. above the engine room floor. The line of pipe to the left, containing a check valve at the top and a globe valve in the center, is the oil-supply line running from the main oil-receiving tank in the basement; the line of pipe to the right is the air-supply line running through a reducing valve to the main air receiver in the basement. Between each of these pipes and the adjoining pipe standard is erected an upright air compressor connected to the main air receiver. These compressors work independently of each other or together as may be desired. Just below the fountainhead and connected to it by the main oil-feed pipe are placed two pressure filters, which work independently of each other or together as may be desired. Back of the whole is placed a fountainhead board on which are located the necessary gages showing the pressure carried on the main air receiver, main engine oil receiver and main cylinder oil receiver. The fountainhead itself is equipped with its own pressure gage, gage glass, cocks, etc., besides having



THE FOUNTAINHEAD AND PUMPS.

a small independent line of pipe running to and over the large filter in the basement. In this pipe is placed a pop or relief valve, which works automatically to relieve the fountainhead when, in forcing oil into it from the main receiver, the pressure becomes greater than the maximum used for feeding purposes.

## Code for Boiler Tests.

At the December meeting of the American Society of Mechanical Engineers, Messrs. Emery, Porter, Barrus and Kent, as a sub-committee of the committee appointed in 1895 to revise the Society's Code for standard boiler tests, submitted a report in the form of a paper, "subject to revision." The report is quite voluminous and fills 52 pages of the Transactions, notwithstanding that the appendices of the 1885 Code, which it has been decided to retain, were omitted; these appendices will be given in full when the report is finally revised.

The Code, when completed, will prove very valuable, because, together with the appendices, it will give in a single paper the methods recommended by the eminent engineers constituting the committee for making boiler tests and also descriptions of the various pieces of accessory apparatus. In fact, some of the appendices rise to the dignity of treatises.

The standard of evaporation, one pound of water at 212° F. evaporated into steam at the same temperature, is retained. The unit of capacity is the Centennial standard with the wording slightly changed; its definition is as follows: "In all standard trials the commercial horse-power shall be taken as 34½ units of evaporation; that is, 34½ lbs. of water evaporated from a feed-water temperature of 212° F. into steam at the same temperature. This standard is equivalent to 33,317 B. T. U. per hour. It is also practically equivalent to an evaporation of 30 lbs. of water from a feed-water temperature of 100° F. into steam at 70 lbs. gage pressure."

The two methods of starting and stopping a test known in the 1885 Code as the "standard" and the "alternate" methods are retained, but a modification of the method of computing the rates of combustion and evaporation is to be made when the standard method is employed, so that there appears to be no good reason for retaining the "standard" method. The language of the Code is as follows: "When the 'standard method' of starting and stopping the test is used, the hourly rate of combustion and of evaporation and the horse-power may be computed from the records taken during the time when the fires are in active condition. This time is somewhat less than the actual time which elapses between the beginning and end of the run. This method of computation is necessary, owing to the loss of time due to kindling the fire at the beginning and burning it out at the end."

The Code recommends two methods of defining and calculating the efficiency of a boiler:

1. Efficiency of the boiler, equal to the ratio of the heat absorbed per lb. of combustible to the heating value of 1 lb. of combustible.
2. Efficiency of the boiler and furnace, equal to the ratio of the heat absorbed per lb. of coal to the heating value of 1 lb. of coal.

The first, sometimes called the efficiency based on combustible, is recommended as a standard of comparison for all tests and is to be understood as the one referred to when the word "efficiency" is used without qualification. The second, sometimes called the efficiency based on coal, however, is to be also included whenever the object of the test

is to determine the efficiency of the boiler and furnace together with the grate (or mechanical stoker), or to compare different furnaces, grates, fuels or methods of firing.

In calculating the efficiency where the coal contains an appreciable amount of surface moisture, allowance is to be made for the heat lost in evaporating this moisture by adding to the heat absorbed by the boiler the heat of evaporation thus lost.

It is apparent that in determining the efficiency of the boiler the "heat absorbed" may be ascertained much more readily than the "heating value." To get the latter recourse must be had to calorific tests or to analysis, or to both. This opens up the whole subject of coal calorimetry as a mere introduction to the subject of efficiency, and the former is one of the most mooted points connected with boiler testing. The Code says: "The rational method of determining the total heat of combustion is to burn a sample of coal in an atmosphere of oxygen gas. The chemical analysis of the coal should be made only by an expert chemist. The total heat of combustion computed from the results of the ultimate analysis should be obtained by Dulong's formula (with constants modified by recent determinations), viz.:  $14,600 C + 62,000 [H - (O \div 8)]$  in which C, H and O refer to the proportion of carbon, hydrogen and oxygen respectively, and determined by the ultimate analysis. It is recommended that the analysis and the heat test be made by two independent laboratories, and the mean of the two results, if there be any difference, be adopted as the correct figures."

Appendix XIV, by Mr. Kent, discusses comparative calorimetric tests of coals and gives the results obtained by different experimenters with different forms of calorimeters, and says in conclusion: "The conclusion to be drawn from the two series of tests tabulated above is that closely concordant results may be obtained from different calorimeters when properly handled by expert chemists, and that these results will agree with the results calculated from accurate analyses; but that occasionally very erroneous results may be obtained, and that a single calorimetric test unchecked by comparison with a test by another calorimeter is to be regarded with suspicion, especially when the test is made with a Thompson calorimeter, when the reported heating value per lb. of combustible is low compared with the results of other tests of coal from the same region, and when the boiler efficiency calculated from such calorimetric test is high."

The committee reports that it is expected that Prof. Thurston will submit an appendix on coal calorimetry.

The recommendations as to using coals regarded as commercial standards when making tests of efficiency or capacity are similar to those in the 1885 Code.

"For New England and that portion of the country east of the Allegheny mountains, good anthracite egg coal, containing not over 10 per cent of ash, and semi-bituminous Cumberland (Md.) and Pocahontas (Va.) coals are thus regarded. West of the Allegheny mountains, Pocahontas (Va.) and New River (W. Va.) semi-bituminous, and Younghiogheny or Pittsburg bituminous coals are recognized as standards. There is no special grade of coal mined in the western states which is widely recognized as of superior quality or considered as a standard coal for boiler testing.



## COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION.	MONTH.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel per k. w. h.	Price of Fuel per Ton of 2,000 Lbs.	Kind of Fuel		
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.	Total.								
2.....	Oct.	138,140	.400	.350	.091	.....	.038	.879	7.02	9.77	.643	4.21	\$2.50	Bituminous.		
3.....	"	187,676	.606	.361	.094	.....	.017	1.094	5.54	8.26	.....	5.7	2.12	"		
4.....	"	277,655	.460	.232	.037	.....	.004	.736	4.32	7.2	.....	4.25	2.16	"		
5. Metropolitan Elevated, Chicago.	"	1,110,154	.483	.190	.017	.....	.010	.027	.727	4.1	2.0	4.69	4.34	.....		
6.....	"	513,300	1.049	.217	.060	.....	.....	.084	1.423	.....	.....	2.74	.....	Oil.		
8*.....	"	1,027,568	.812	.214	.052	.....	.....	.040	1.118	.....	.....	.....	.....	Slack.		
9*.....	"	186,295	1.252	.443	.063	.....	.....	.062	1.820	.....	.....	.....	.....	.....		
10. Metropolitan Kansas City, Mo., Central Av.**	"	314,626	.304	.156	.014	.....	.....	.011	.018	.550	1.97	1.75	.....	5.02	1.20 to 1.40	Bituminous

\*Increase cost of fuel due to coal strike.

\*\*Miscellaneous expense .017 cent per k. w. h.

Big Muddy lump, an Illinois coal mined in Jackson county, Ill., is suggested as being of sufficiently high grade to answer the requirements in districts where it is more conveniently obtainable than the other coals mentioned above."

In a foot-note it is stated that these coals are selected because they are about the only coals which contain the essentials of excellence of quality, adaptability to various kinds of furnaces, grates, boilers and methods of firing, and wide distribution and general accessibility in the markets.

For the determination of the moisture in the steam the barrel calorimeter of the old Code is superseded by the throttling or the separating calorimeter, either kind being used. This is in accord with the practice of recent years.

In measuring the area of the heating surface it is directed that the outside diameter of the tubes be taken, whether fire tubes or water tubes, the change being made in an endeavor to make the practice in rating heating surface uniform.

As to smoke observations the Code says: "It is desirable to have a uniform system of determining and recording the quantity of smoke produced where bituminous coal is used. The system commonly employed is to express the degree of smokiness by means of percentages dependent upon the judgment of the observer. The committee does not place much value upon a percentage method, because it depends so largely upon the personal element, but if this method is used, it is desirable that, so far as possible, a definition be given in explicit terms as to the basis and method employed in arriving at the percentage."

The appendix (XXXVII) on this subject, written by Mr. Barrus, describes a novel method of obtaining a continuous smoke record and is as follows:

"In a series of competitive trials between two furnaces which the writer made in June, 1897, for the Detroit Water Works, a method of obtaining a continuous record of the quantity of smoke was introduced, which seems to him of great value in making specific what has heretofore been based upon the judgment of the person conducting the observations. The method referred to consisted simply in suspending, at a suitable point in the smoke passage between the boiler and the flue, a smooth, flat, brass plate, having its face at right angles to the direction of the current.

This plate served to collect a certain portion of the soot which was carried along by the waste gases, and indirectly furnished a means of sampling the gas in respect to its smokiness. The plate was 24 in. long and  $\frac{3}{8}$  in. wide, and it presented a surface amounting to 21 sq. in. Being inserted through a hole in the top of the flue, and suspended by a wire, the hole being covered, the plate could be readily withdrawn from its place whenever desired, and the collection of soot removed by the use of a stiff brush. This was done every two hours during the progress of the trial. The quantity of soot which collected on this plate varied according to the type of the furnace and the character of the fuel, as also according to the conditions of the firing and the working conditions of the boiler. The records of the smoke-measuring device, and those of the ocular observations of the chimney, were in accord with each other. The quantity of soot which was collected, reduced to the hourly rate, varied in these tests from 9 milligrams to 184 milligrams. The method has not as yet been tried in the case of a flue carrying very dense smoke."

### GAS ENGINE AT LANCASTER, O.

W. F. Kelly, general superintendent of the Columbus Street Railway, writes us concerning the 100-h. p. gas engine installed in the summer of 1896 in the street railway power house at Lancaster, O., as follows:

"Our total expense for repairs to engine, piping, cooling tank, and everything connected with it during the first 10 months of this year was \$49.33, or about 16 cents a day. As all repairs and adjustments must necessarily be made after shutting-down time, and men are paid extra for their labor at this hour, it will be readily seen that most of this expense has been for labor. I believe that but few, if any, steam plants, operating under the same conditions of service, could show an equally favorable record."

The gas used is natural gas, and the road is a small one which could not afford to maintain a steam plant.

John W. Borchinal, a director of the Moundsville, Benwood & Wheeling Electric Railway, has been active in making arrangements for building an electric line from Frostburg, Md., to Piedmont, W. Va., a distance of 18 miles.

## IMPROVED DEVICES AND METHODS FOR THE SAFE OPERATION OF CARS ON INTER-URBAN AND CITY LINES.

During the past three months several collision accidents, two attended with fatal results, have occurred on interurban roads. Two of the disasters were primarily due to heavy fog, which prevented the motormen from seeing the approaching car until the two were only a short distance apart; the others were caused by various reasons, such as meeting on curves where the track was laid in a cut, etc. It has seemed to us that the safe operation of interurban lines, most of which are of single track, is a subject deserving careful study, especially by such roads as thus far have not worked out as perfect a system as they would like.

While the experience of steam road operation has taught us that even the best system and the most expensive mechanical appliances are not infallible, and do sometimes fail in the most important moment; yet the art of moving frequent trains on a single track has been brought to that degree of certainty that head-on collisions so frequent 15 years ago are now a matter of unusual occurrence.

The electric roads do not need the telegraph, so essential to the steam lines, but the telephone has been adopted in some cases as an improved substitute, and mechanical devices have been perfected and are already installed, not only on interurban but at dangerous points in urban service, such as crossings and draw bridges.

We propose in this and succeeding articles to show what has already been adopted and put in operation throughout the country, and though the method selected by any one road may not be the best or as good for all the others, owing to the diversity of local conditions, we believe that the study of them all will suggest possible improvements to many. Where no other precaution than the time table is employed, except on lines operating only a very small number of cars, we would urge upon the manager the adoption of additional safeguards, even though it involve some expense at the start.

Road No. 1:—As our line is yet incomplete, we have not put in operation any blocking device, although we expect to do so as soon as the road is in full operation. At present we have but one turnout, and instructions are for a car to lie at that point for 10 minutes beyond the schedule or regular meeting time, then to proceed at half speed very cautiously; the car that is late or caused the delay also runs at half speed, and will know that the first car is entitled to the right of way. This plan is of course open to much objection, and will fail utterly if car men are given to taking chances.

I believe the best scheme is that of a private telephone line, with special instruments, such as are furnished now by a number of makers. Place a connection box on a pole at all turnouts, and between if desirable, and have each car carry the detachable combination ear and mouth piece; then in event of any delay or accident to a car occurring at any point on the line, the conductor will at once proceed to the nearest connection box, "plug in" his instrument, notify the office, and receive instructions. In the same way the other cars or crews ask for orders when the delay occurs at meeting points. Thus cars may be shifted when all are late and put upon schedule again. Of course no method is infallible, as reckless car men will often go contrary to or-

ders, but with careful, competent men, and means supplied by which they can quickly communicate with the office, I think the chances of accidents are remote.

Road No. 2:—On our single track road we use the ordinary block signals, although it has not prevented, on one occasion, an end-on collision, although that was due entirely to the negligence of the crews in not using the signals. The great trouble on this occasion, and I suppose it exists on all roads, was an exceptional motorman with a "large head" who thought he could "make it." I find the safest plan is to relieve such men from such positions as quickly as possible. We believe the block system is the most feasible plan to date, although they are useless in the hands of such men as above referred to.

Road No. 3:—Has 20 miles single track.—I am glad to see that you have taken hold of this matter, as I feel that it is one of utmost importance. There is no question but what it is a good field for inventors. In my estimation some sort of a signaling system, controlled from a central point by an operator, that will automatically indicate to the operator when cars pass given points, would be the most satisfactory arrangement for interurban lines. The one thing that is against such a system is the first cost.

On our road we use the telephone system, having a telephone at each side track; this works very well, but there is always the liability of a misunderstanding between the dispatcher and the party to whom the order is given. We have had this occur once or twice, even after taking the precaution to have all orders repeated when received.

At present I know of nothing used by interurban roads that is as satisfactory as the telephone, but still I feel that there is lots of room for improvement, even there.

Road No. 4:—30 miles.—At present we have no such system, only requiring by post signals that motormen run slowly at dangerous places. We, however, appreciate fully our need for a system, and have decided to install one before our heavy summer traffic opens. We have been investigating, and are undecided, between an electric block signal and a telephone dispatching system.

Road No. 5:—40 miles—city line: When the weather is foggy we try to use every precaution possible. All motormen are instructed, when leaving the station, to use extraordinary care in the running of their cars, so as to avoid collisions. This warning is given by foreman of the station from which they start. Then we have our superintendents and street assistants on the street at the time, and the cars are allowed to consume all the time necessary in making the trip, even if two hours are consumed, although the run ordinarily may not be more than 30 or 45 minutes. Safety, above all, is to be considered.

Road No. 6:—30 miles.—Has the following bulletin to its car crews:

When it is stormy or a fog prevails that is thick enough



to obscure the track so that you are unable to see at least 500 ft. ahead, you will not run your car at a greater rate of speed than 3 miles an hour, and in such cases you must sound your gong continually. You must never leave a siding until you are sure there are no cars coming from the opposite direction. You can ascertain this by listening, as the vibration of the trolley wire will cause a rumbling noise in a car that is at a standstill when the car in motion may be 500 or 600 ft. distant. Should your car become disabled or stalled by snow or any other cause, you must, if on single track, guard both ends of the same by going in either direction at least 300 ft. and warn all approaching cars or plows of your position. If on a double track, it will be necessary to guard the rear end only. If necessary to do this, the motorman must throw off the overhead switch on both ends of his car.

Road No. 7:—We are all double track except on two ends, one of these with only one car on at a time, and the

Road No. 9:—11 miles.—We do not allow our men to take any chances whatever, and deem it sufficient cause for discharge to jump a switch without orders from the superintendent. If, for any reason, a car is started from the house to take the place of a disabled car, it is either run double head with a regular, or, if running alone, the conductor is obliged to signal ahead on every corner and curve between switches. If a car is disabled, or has laid longer than the limited time on a switch, the trainmen telephone to the car house for orders. As stated above, we do not allow any chances to be taken.

In this connection a description of the

### Skeen Signal System

will be of interest. It has been worked out and already introduced on several roads, where it is working with great satisfaction, by the Skeen Electric Switch & Signal Com-



FIG. 1.

FIG. 3.

FIG. 2.

#### SKEEN BLOCK SIGNAL SYSTEM.

Fig. 1. A siding showing a signal at each switch—"All clear!"—Fig. 2. Car leaving siding, entering block. White signal acting as rear block, and showing that red signal has operated at the other end of the block, and is holding an approaching car as in Fig. 3.—Fig. 3. Red signal holding car till arrival of the car shown in Fig. 2.

other with two cars and one switch. We are running on the old system, but we should not wish to run a single track interurban without either a good block system or by use of telephone.

Road No. 8:—11 miles.—The nature of our interurban service is not exacting with respect to the points which you raise. On one line we have only one car operating on a regular schedule, and on the other line two cars. On the latter line we have a turnout about midway, which is an established meeting point under normal conditions. Our car barn is situated near this turnout, and should one car be detained at the terminus, by reason of trains being late, etc., the conductor notifies the foreman at the car barn, or the conductor of the other car, of the fact.

For interurban service requiring a considerable number of cars and high speed a double track is, of course, the best solution of the problem, when feasible; otherwise we should suggest frequent turnouts with established meeting points, together with a block system, and, as an additional precaution, telephonic dispatching at such times as the schedule became seriously interrupted or disturbed.

pany, of St. Louis. Many of our readers will recall the interesting exhibit made at the Niagara convention of the Skeen automatic signal. This signal is intended for use at the crossings of steam and street railways, approaches to draw bridges, tunnels and other danger points. Its work is entirely automatic, and the danger signal is locked until the car passes.

For interurban operation the two-way Skeen signal is especially adapted to single-track roads, the line being divided into blocks by the sidings.

The car is governed by the signals on the right of the track, whether going or coming, and always takes the turnout to the right. A car going into this siding (from the direction of the reader) is not governed by the signal on the left of track, but the motorman sees the signal on the right is at normal with its targets flat and lights out, and knows the block ahead is clear. As he pulls out toward the signal, his trolley throws a red danger signal at the farther end of the block he is entering, thus warning any car coming towards that end that this car is on this block. This danger signal is a red target and a red light, and both are thrown whether it be night or day.

Not only is the danger signal set ahead for the car coming, but the motorman knows before he leaves his siding that it has been set. The signal on the right is so wired to the signal ahead that a safety signal (a white target and a white light) is shown to the motorman at this end, and at the same instant he sets the danger signal at the farther end of the block. This "tell-tale" gives positive evidence that the danger signal has been set and locked, as this tell-tale at this end cannot operate, unless the danger signal ahead has been thrown and locked.

As the car enters the block both the motorman and conductor have assurance from the white tell-tale that the block ahead is clear and is being held for them alone. They can therefore go ahead with confidence and safety; the conductor rings "go ahead" as soon as he also sees the tell-tale. Thus both are held responsible.

The danger signal thus set ahead can only be unlocked and reset to normal by this car, on leaving the block at the other end, and passing the siding where the other car is being held by the danger signal.

The consumption of current is only one ampere and that only for the fraction of a second, while the trolley wheel is passing the contact above the trolley wire. The voltage may drop 250 volts without affecting the operation of the signal, which is adapted for working between 300 and 550 volts. For less than 300 volts a special wiring is provided.

The tell-tale also serves as a rear block to the car setting it, and would hold a second car which might be following too closely, until the first car had run out of the block and allowed the tell-tale to drop to normal position. In this way an absolute check is provided against more than one car entering a block, even though both are running in the same direction.

T. F. Sneed, general superintendent of the St. Louis & Suburban, which has used the Skeen system for 10 months past, states: "We also have on the St. Louis & Meramec River Railroad 4 miles of single track equipped with 14 Skeen signals; they also have given complete satisfaction. In fact, it would be impossible for us to operate this track without these signals, as we make about 250 trips per day on that section, it being a joint track.

"I have used all kinds of semaphore signals on steam roads, and can conscientiously say that yours is the best signal I have ever seen used. They have never been known to fail once, except when the voltage was so low that the cars could scarcely get over the road; that was not the fault of the signal, however. I consider your signals simply indispensable to anyone using a single track."

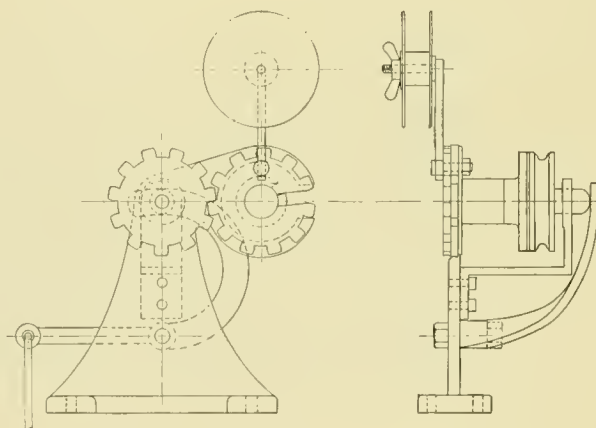
A four-way signal is also furnished for use at intersections, which dispenses with the flagmen placed at such points. This signal sets at a distance of 200 ft. or more, as desired, according to the grade, rate of speed at such points, etc.

(To be continued.)

In Indian Engineering an extract is given from the draft order providing for the use of the Calcutta tramways for scavenging and other municipal services. "The Municipal Council may during such hours, not exceeding 6 in the 24, as may be prescribed, use the tramways for moving night soil, ashes, refuse, coal, gas and water pipes, road material, etc., free of all tolls and charges. The motive power shall be selected and furnished by the tramway company."

## A TAPE WINDER.

A coil taping machine, which has proved a labor-saving device, has been patented by C. E. Moore, master mechanic of the Chicago City Railway. A large stock of armature coils is kept in stock at the repair shop, and girls are employed to tape the coils by hand. By the use of this small machine, between two and three times as much work can be accomplished. The tape is held in the spool shown in the upper part of the cut, and any desired tension put upon it by the thumb screw shown. The spool is fastened to a gear which rotates it. The hollow center in the gear is provided for the coil to be wound. To get the coil into the center a slot is cut out of the gear and the ring about which it revolves. The gear meshes with another one of the same size, which is on the driving spindle. The pulley shown in the elevation is driven by a round belt and drives the gear spindle through friction disks. The friction disk is worked by a lever one end of which is curved in two planes, as shown, so that when moved up it presses the belt pulley against the leather disk. There is a treadle attachment so



TAPE WINDER—CHICAGO CITY RAILWAY.

that the lever can be thrown on and off by the foot of the operator.

The coil is placed in the hollow center, the end of the tape is given a turn around the wires, and a pressure on the treadle starts the spool revolving, winding the tape around the wires of the coil. The operator simply moves the coil along fast enough to give it the proper covering of tape. Some special cotton tape will be provided as it is believed that cotton will prove just as durable and as good an insulator as linen. The cotton tape will not be treated with any insulating compound, and when wound will only have sticky substance at the end. Each spool will have just enough tape to cover one coil, several spools being provided for the machine.

The Nassau Electric Railroad Company recently performed a new class of service. A section of the new park at Dycker Meadows needed filling in, and some building property on 44th street between 5th and 6th avenues required excavating. The contractor put in a switch and transported the dirt over the tracks of the trolley road in ordinary dump cars, the motive power coming from some old summer cars. Much time and expense were saved thereby.





Interesting Bits of Information from all Parts of the Country,  
Boiled Down for Busy Readers.

By a typographical error in our December issue the population served by the New Castle (Pa.) Traction Company was stated to be 12,000, instead of 32,000, which is the present estimate.

W. W. Annable, superintendent of the power station of the Consolidated Street Railway Company of Grand Rapids, Mich., will soon make a test of a chainless bicycle of his design.

The street railway companies of St. Louis will be presented with a numbered plate, 4x7 $\frac{3}{4}$  in., for each car license paid in 1898. The plates are to be fixed on the cars in conspicuous places.

Press reports state that on December 20 two pasteboard boxes came in contact with the steam pipes in a car on the 6th avenue elevated road, New York, and exploded, injuring two persons.

December 26 an electric car in Providence got beyond control of the motorman on Olney street hill, left the track and struck a frame building. Three of the twelve persons on board were slightly injured.

The Northwestern Elevated Railroad Company has sued the Chicago Daily News Company for libel, laying the damages at \$500,000, because of an editorial published by that newspaper on December 31, 1897.

An attempt, very nearly successful, to rob the safe in the general offices of the Duluth Street Railway Company was made recently. After drilling two holes in the safe the burglars were frightened away by the watchman.

An ordinance was passed in East Orange, N. J., imposing a fine of \$25 for every tree destroyed in stringing trolley wires. The Consolidated Traction Company appealed to the Supreme Court, but the ordinance was upheld.

In New York three men have been arrested charged with stealing rails from the Metropolitan Company. Rails to the value of \$1,200 have disappeared; \$600 worth were found in the junk shop of one of the men under arrest.

The franchise for the Milford & Dover (Del.) Electric Railway has been sold to New York capitalists. The proposed route is from Milford to Frederica, and thence to Magnolia, to Camden, to Dover, to Smyrna, to Woodland Beach.

One Louis Kerr has been arrested for stealing copper wire and bonds from the Louisville Railway Company, which in the last six months has suffered a loss of copper by theft of \$600 or more. The superintendent identifies the wire found on Kerr.

The Altoona & Logan Valley Electric Railway was sued by John Bement for \$5,000, damages being claimed because the conductor refused to accept a 10-cent "shinplaster" of 1862 in payment of the fare. The jury found for the company.

The gross earnings of the Brooklyn Rapid Transit Company's system for December were \$446,800, which is \$14,000 in excess of 1896 and \$40,000 in excess of 1895. For the half-year the gross earnings were \$2,805,000, an excess of \$68,000 over 1896 and \$216,000 over 1895.

The Central Railway & Electric Company of New Britain, Conn., has presented long service badges to the employes who have been in the service more than five years. There are six motormen and conductors who are entitled to wear the monogram on the lapel of their coats.

E. E. Downs, manager of the Citizens' Traction Company, Oshkosh, Wis., is receiving many commendations for the way work has been pushed on the extensions to the lines. A summer resort is under consideration by this road, but the plans have not as yet been decided upon.

The Brooklyn Elevated is experimenting with a device for placing the different stations on the line in connection with the office, so that the number of people passing the station turnstiles may be automatically recorded and indicated in the office. One station is at present so connected.

The street railway postal service has been extended in Chicago. The West Chicago Street Railroad Company receives \$1,830 more per year for transporting the mails to stations E and G. The North Chicago Company now carries mail to station B, and the Chicago City to station N.

The Southwest Electric Railway, Cartersville, Mo., has been sued for \$10,000 by a woman who was struck on the head by the brake handle while boarding one of the company's cars. There was a large crowd at the time and a mad scramble for places, during which the accident occurred.

A trolley parlor car, containing Mayor Wurster, ex-Congressman T. L. Johnson, President Johnson of the Nassau Electric Railroad Company, President Rossiter of the Brooklyn Heights Railway Company, and other prominent citizens, ran over the tracks of the Nassau electric railway and across the Brooklyn bridge to New York while the last moments of the old year were passing. Some alterations were necessary on the bridge, but these were soon completed, and now the trolley cars run from Park Row in New York city to Coney Island.

Trolley wire thieves are still troubling the street railway companies. At Milwaukee two discharged linemen of the railway company procured a horse and wagon and cut down 1,200 ft. of wire early in the morning when the current had been turned off the line. It happened that a test was being made and it was found that there was something radically wrong. The linemen arrived at the scene just as the robbers were driving away with their booty. The police were notified and the men arrested. The Lynn & Boston Rail-

road Company has suffered a similar loss. Nearly a mile of wire was taken from the line running in Revere. This part of the road is used only in the summer time, and both last winter and the year before the trolley wire has been cut down and carted away.

The Houston (Tex.) Electric Street Railway Company recently distributed \$500 among the motormen and conductors who had the best records. There were 40 men whose reports were free from complaint and these received \$10 each. About 20 others whose records were good received \$5 each.

The Atlanta Consolidated Street Railway Company has just completed two 42-ft. cars in its shops for service on the line to Decatur. The cars are complete in all their equipment, having air brakes, electric heaters and large motors. With these cars the schedule will be shortened from 45 minutes to 30 minutes.

D. H. Louderback, president of the Lake Street Elevated, is reported to have stated to Judge Grosscup of the federal court, before whom the foreclosure suit is pending, that there is a plan on foot to consolidate all the Chicago elevated roads. The chief obstacle is the foreclosure suit against the Lake Street.

The report for 1897 shows that the past year has been a very prosperous one for the Buffalo & Niagara Falls road, the gross earnings were \$69,663, an increase of \$15,136 over 1896; the operating expenses were \$23,382, an increase of \$10,344; the net income (after paying fixed charges) was \$31,940, an increase of \$9,328.

The Citizens' Street Railroad Company of Indianapolis has been sued for \$1,000 by William Poynter because he was refused a ride on a transfer. During the state fair a transfer was issued to him, but on account of the crowds he was unable to board a car. The next day he attempted to use the ticket, but was ejected.

The Philadelphia & Bristol Trolley Company has called upon the stage coach to assist in its competition with the Pennsylvania Railroad Company. Each hour a coach runs between Corydon and Bristol, carrying passengers for 5 cents and making the total fare to Philadelphia 18 cents, while the railroad charges are 57 cents.

A dense fog was the cause of two rear-end collisions on the Manhattan Elevated Railroad, one resulting in the injury of two passengers and the fireman. The locomotive and the rear coach were shattered. The trains were full of passengers, who were considerably shaken up. The other collision was not so severe and the trains were empty.

The Louisville Trust Company, which furnished the money to build an extension of eight miles to the Main Street Railway in Cincinnati, originally only three miles long, has won the suit brought against it by the trustee for the first mortgage bondholders. The latter claimed that their mortgage covered the extension as well as the original line.

The Board of Aldermen of Brooklyn passed an ordinance granting a perpetual franchise to Patrick H. Flynn for a right of way for the East River & Atlantic Ocean Railroad, which would be operated through 40 miles of streets. Mayor Wurster vetoed the resolution, as some of the streets had been newly paved at great expense, and the transportation facilities were not needed.

A passenger on a blockaded Broadway cable car walked several squares ahead of the blockade and caught a car on that line which was in operation. He was arrested for refusing to pay his fare, but was discharged in the police court. He brought suit against the street railway company for \$20,000, but after a short examination the judge ordered the jury to return a verdict for the defendant.

A large fire on Madison street near Dearborn, Chicago, blocked the North Chicago and the Madison street cable lines from the afternoon of December 23 until nearly noon the following day, because of the large number of hose lines carried across the tracks of the two cable loops. Much needless inconvenience was suffered by Christmas shoppers who were not aware that the North Chicago road was operating as usual north of the river.

The snow storm, which visited Pittsburg and Allegheny, blockaded nearly all the street railway lines in the two cities. The greatest difficulty was caused by the telegraph and telephone poles giving way under the heavy weight of ice and snow. The falling poles carried many trolley wires and feeders down with them. The officers and men of the street railway companies went to work and soon cleared the tracks from snow and replaced the wires.

C. L. Rossiter, president of the Brooklyn Rapid Transit Company, has sent a printed address to the employes of the company, complimenting them on the efficient service now rendered. He exhorts them to put forth every effort to avoid accidents, to keep the cars neat and clean and to be very attentive to the patrons of the road. He calls attention to the fact that over \$2,000,000 was paid in wages last year and that increased earnings mean a greater expenditure for wages.

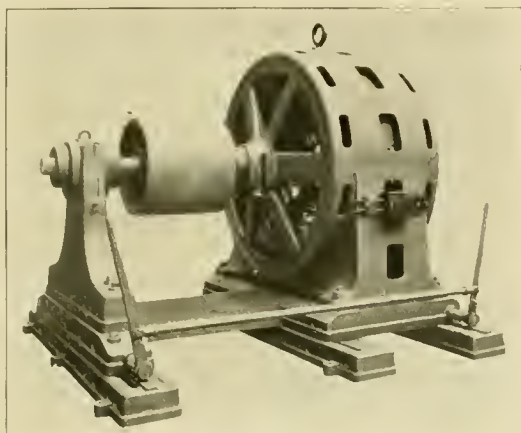
The Union Traction Company, of Philadelphia, has issued an order restricting the use of the 8-cent exchange tickets. By the use of these tickets the purchaser was enabled for 8 cents to take a ride over two routes, involving a change of cars, but many patrons have abused the privilege by using them as round-trip tickets, making practically a 4-cent fare. Certain transfer points are printed on the tickets and their use is now restricted to these junctions.

The Worcester & Suburban Street Railway Company has heretofore provided its employes with pass books which entitled them to ride at any time. A large number were in use and to trace out these tickets required a considerable amount of time in the accounting department. An order was issued recalling all the books. The employes took exception to this and signed a petition to have the order revoked, but it will stand. As the employes can ride free at any time with their uniforms it works no great hardship upon them.



**A LARGE INDUCTION MOTOR.**

The illustration represents a 400-h. p. two phase, induction motor, built by the Westinghouse Electric & Manufacturing Company for the Buffalo & Niagara Falls Electric Light & Power Company. Two of these machines are in operation and one of the same type, but of 500 h. p. capacity, is now building, these being the largest motors of this kind



400-H. P. INDUCTION MOTOR.

ever constructed. The efficiency is equal to, if not greater than, the best motors of any type. This motor is remarkable in that it requires practically no attention, having no commutator or collector, no brushes, nor even any sliding contacts. The bearings are self-oiling, and from no load to full load the speed drops off very little. These motors drive alternators at a frequency of 60 cycles per second.

**TAX DECISION IN KENTUCKY.**

In the case of the city of Covington, Ky., against the South Covington & Cincinnati Street Railway Company to recover taxes for the years 1893 to 1895, inclusive, on the franchises of the company, the court has overruled the demurrer in behalf of the company. As there is no question that the taxes have not been paid, this virtually decides the cases now pending against the various corporations of Covington. The case will be appealed to the higher courts.

**CONDUCTIVITY OF CAST-WELDED RAIL JOINTS.**

We herewith publish the results of some tests of a cast-welded joint and a copper-bonded joint made by James R. Chapman, chief of the electrical department of the North Chicago Street Railroad. The illustration is a view of a section of the cast-welded joint tested, kindly lent us by Mr. Chapman.

With a view of determining the electrical value of a track return system when the rails are joined by what is known as the cast-welded process—as against the same rail with 6-hole fish plate joints and copper bonds—experiments were made December 17, 1897, at the California avenue power station of the Chicago Electric Transit Company.

Joints of each description were placed between the neg-

ative terminal of a generator and the bus bar. Simultaneous readings were then taken—at the 10-second intervals—showing the amount of current flowing through the rail, also the drop in potential along 5 ft. (lineal) of rail carrying the joint as compared with the drop due to an equal length of rail without joint.

CAST-WELDED RAIL.			
Test Number.	Average current flowing, amperes.	Drop in 5 ft. with joint, volts.	Drop in 5 ft. without joint, volts.
1.	792.5	.0583	....
2.	890	....	.0553
3.	860	....	.0526
4.	830	.0535	....
BONDED RAIL.			
5.	837	.1218	....
6.	837.2	....	.0585
7.	239.7	....	.0159
8.	328	.0476	....

The rail used was of 6-in., 72-lb., girder section; the cast joint was made on the street by the contractors at the same time that some track was being welded two weeks previously. No special care was taken in making this joint and no extra cleaning was done. Length of cast block 14 in., weight of metal 129 lbs.

The bonded joint, however, was made with great care.



SECTION OF CAST-WELDED JOINT.

Two No. 000 36-in. "Chicago" bonds with tinned 13-16-in. terminals were used; the holes in the rail were cleaned and tinned; the web of the rail around the hole was faced on both sides with a rose reamer 1½ in. in diameter. The bonds were then driven and expanded, all the joints being immediately flushed and wiped with solder. One and one half miles of double track recently bonded in this way cost \$1.50 per joint.

These tests indicate that the average cast-welded joint has about 97 per cent of the conductivity of the rail with a current flow of 115 to 120 amperes per sq. in. of rail section; while a bonded joint, with the flow of current reduced so as to be less than one ampere per circular mil of copper in the bonds, has only 46 per cent of the conductivity of the rail, the calculated loss in the bonds alone being 62 per cent of the total drop as measured.

Carrying this calculation a little further and it appears that to electrically connect two 72-lb. rails as perfectly as by an average cast-weld requires the use of upwards of six No. 000 36-in. bonds with soldered terminals as above described.

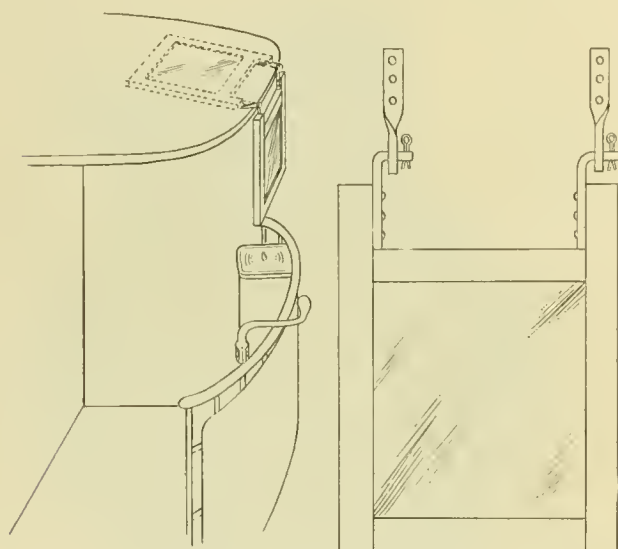
Jas. R. Chapman.

Chicago, Dec. 30th, 1897.

In this connection we might add that the work referred to, including the joint illustrated, was done by the American Improved Rail Joint Company, of Chicago, of which A. S. Littlefield is president.

### A FACE PROTECTOR IN MAINE.

The description and sketches of the motorman's protector herewith illustrated were sent us by F. B. Lee, superintendent of the Norway & Paris (Me.) Street Railway, who states that it admirably serves its intended purpose of protecting the motorman's face. It consists of a frame 20 in. high and 28 in. wide, with glass set in it, hung from front edge of the hood, as shown in the sketch. It is hung from pin-and-eye hinges and is prevented from swinging by a coil spring, which is a brush-holder spring; when not needed



MOTORMAN'S PROTECTOR IN MAINE.

the frame is swung up and lies on the roof, as shown by the dotted lines. The frame is removed by taking out the two cotter pins, and is easily transferred from one end of the car to the other.

The glass does not frost, and sleet can be easily brushed off, so that it offers no obstruction to the view of the motorman. If so simple a device is found to give satisfaction in Maine, where the winters are very severe, it would seem that it might be substituted for a vestibule in some other of the states; it certainly has none of the disadvantages which are strongly urged against the latter.

The superintendent of an eastern road in transmitting his subscription to the "Review" says: "I feel that I have received at least \$10 for \$1 from your paper the past year. No trade paper which comes to my desk equals it for practical assistance." And such as this makes the editorial heart glad.

### VESTIBULES IN DENVER.

The city of Denver has a vestibule ordinance which went into effect on November 12 and requires that vestibules be placed on cars from November to March, inclusive. No time was allowed for the roads to equip their cars, and feeling that this was unreasonable the street railway men have moved slowly in matter of complying with the ordinance. The several companies are experimenting with different types of vestibules and have not yet decided which is best suited to their needs. It is stated that in Denver there are but 40 days in the year when a vestibule is at all desirable, instead of the 151 provided by the ordinance.

### SIGNALS ON THE DETROIT & OAKLAND.

The Detroit & Oakland road, which it will be remembered experienced a collision in December, has adopted a signal system which is described as follows:

"Four locked boxes are placed at as many switches along the line. They contain wooden blocks numbered 1, 2, 3 and 4. The first car out takes block No. 1, and cannot pass the first switch on the return trip until it secures block No. 2 from the second car and gives up block No. 1. At the second switch block No. 3 is secured, and so on. The motorman is the custodian of the block, and he is not allowed to start his car until he has the new one in his possession."

### A BIG CAR BARN FOR THE CALUMET.

The Calumet Electric Street Railway Company, of Chicago, has been handicapped for some time by its limited storage capacity for cars. The summer trail cars had to be left out in the yards all winter with no protection from the elements. Within the past month a building of iron, stone and brick has been finished and shelters 110 summer cars. It is 125 ft. wide and 376 ft. 6 in. long with nine tracks laid its entire length. A space 35 ft. wide along the north side of the building, is reserved for offices and store rooms.

### MURRAY IRON WORKS ALL RIGHT.

The Murray Iron Works, Burlington, Iowa, had an unfortunate experience in being erroneously reported by one of the merchantile agencies, as having filed a deed of trust to protect preferred creditors. What the company did was to execute a trust deed to secure an issue of bonds the proceeds of which are being used in making needed additions to its plant made necessary by a rapidly increasing business. The company advises us it has no debts and therefore no creditors to prefer, and that it has brought suit against the agency for damages.

### A STREET CAR VICTORY.

The postmaster of Chicago applied to the department for leave for the carriers to discontinue the use of bicycles in making their rounds, on the ground that better time can be made by using the street cars, and the request has been granted. In the future the allowance of \$3 per month to each man will be invested in street car tickets instead of bicycles.



**WEST END CAR HOUSE BURNED.**

The Ferry street car house of the West End Street Railway, at Everett, Mass., was burned on the morning of December 23, the fire being discovered about 3 o'clock. The building was one and one-half stories in height, and the greater portion was of wood. The loss on the building is placed at \$30,000, the wood portion being entirely destroyed. There were about 90 cars in the house at the time, only five of which were saved; the cars burned were valued at from \$1,000 to \$1,500 each, making the loss a heavy one.

The illustrations are from photographs of the car house before and after the fire. We have seen no official statement as to the origin of the fire; it is said, however, to have been caused by the heating or crossing of electric wires at one end of the building.

"A few days ago, in my haste to see a patient, I boarded a mule car, and after traveling several blocks it left the track and climbed up on the pavement. The driver started back to town on foot. I said: 'Look here, ain't you going to try to put this car back on the track?' He said: 'No, I ain't; I'm not allowed to turn a wheel until the board of directors meets and passes resolutions as to whether they want it back or not. They don't allow me to assume any responsibility.' I threw two bricks at him and went back home. Gentlemen, the operation of the ——— mule car is one of the sights of this city."

**NEW FRANCHISE IN COUNCIL BLUFFS.**

A franchise, for a term of 50 years, has just been granted to the Omaha & Council Bluffs Railway & Bridge Company by the city council. It was thought best to give a long



CAR HOUSE BURNED AT EVERETT, MASS.

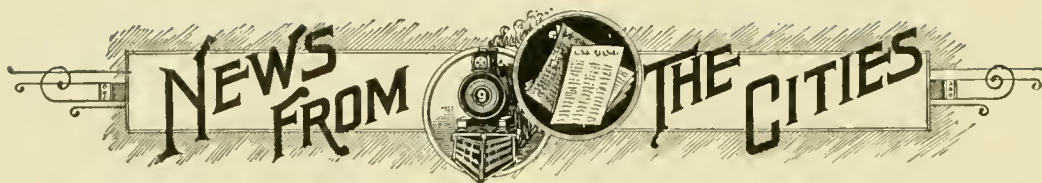
**THE DOCTOR DIAGNOSED THIS CASE.**

At a recent meeting of a medical association in Texas, the city physician, in the course of his address of welcome, found expression in the following, which has the true Texas flavor:

"Gentlemen: We have but little to brag about, and we hesitate to brag a little about what little we have to brag about, but we have in our city the only, as we believe, genuine all-American double-back-acting plug mule street car line on earth. You can observe the operation of the Air-Tight & Great Windy line here in front of the Oriental Hotel (a car passing every other day), listen to the voice of the Jehu, which will notify you to get on the grass until his Juggernaut passes by. From the way he curses you would suppose him to be a Presbyterian, but I understand that he has no church affiliations, simply a drift chip on the tide of time.

time franchise whereby the company could raise enough money to put it in such condition that it could afford modern service in every particular, instead of a short franchise with its accompanying difficulties. For this privilege the company agreed to issue 30-ride commutation tickets, good for 30 days, to be sold for \$1.50 and used between Omaha and Council Bluffs, but not good if used locally, the regular fare being 10 cents. This gives the laboring classes and regular passengers, who live in one city and work in the other, the benefit of a 5-cent fare, but for others the usual rate is maintained.

Preparation is being made for a large business during the Exposition. A 400-k. w. generator, direct connected to a Corliss engine, and 16 43-ft. cars will be added to the equipment. The beneficial effects of the Exposition are already felt in Omaha and Council Bluffs; work is progressing rapidly on the buildings and grounds, and everything promises to be in readiness at the opening, June 1.



### Arkansas.

LITTLE ROCK, ARK.—A franchise to build and operate an electric street railway in North Little Rock has been granted by the city council to M. Greenwood and D. L. Dyas of St. Louis and Maxwell Coffin of Little Rock. Cars must be running within six months.

### California.

SANTA ROSA, CAL.—By the recent purchase of the horses, cars and all other property of the McDonald Street Railway Company, the Union Street Railway Company acquires control and management of all the street railways of Santa Rosa.

### Chicago.

CHICAGO.—The Chicago Electric Traction Company has been incorporated to reorganize the Englewood & Chicago Electric Street Railway. The capital stock is \$2,000,000, and the incorporators are Charles R. Holden, 507 West Monroe street; Carl Meyer, 2009 Prairie avenue; William L. Tibbs, 6049 Ellis avenue; Thomas A. Moran, Jr., 4710 Vincennes avenue; Alfred S. Austrian, 3129 Michigan avenue, and E. R. Gilbert, all of Chicago; Samuel R. Shipley, Philadelphia; Isaac L. Rice, New York; Henry Levis, Philadelphia; Gustave J. Wetzlar and Julius S. Bache, New York.

### Colorado.

COLORADO, SPRINGS, COL.—Bids for track work and rolling stock for 2.5 miles of electric road in Colorado Springs are asked by C. M. Coleman.

PUEBLO, COLO.—The change of the Pueblo Street Railway from four power houses to one is expected to be completed in six months. All the engines and generators now in use at the central station will be discarded. During the next few months the overhead work will be overhauled, and 20,000 new ties laid. The number of passengers carried in October was 11,000 greater than in the October preceding.

### Connecticut.

SHELTON, CONN.—Judge Wheeler having granted the Shelton Street Railway Company permission to extend its line to connect with the Bridgeport Traction Company at Paradise Green. President Radel will push the work with a view to its completion by April 1.

### District of Columbia.

WASHINGTON, D. C.—A bill has been introduced to incorporate the Washington & Annapolis Railroad Company. The incorporators are: Edgar L. Marston, H. C. Knox, Elisha K. Camp, John J. Knox, O. C. Brothers, Jr., Alfred S. Miller, J. Harry James, William G. Morgan, Joseph Bowes, C. H. Syme, W. L. Bryant, and George G. Hazleton.

### Florida.

CLEARWATER, FLA.—H. B. Plant of 12 West 23d street, New York, has received a franchise to build an electric railway in Clearwater.

KEY WEST, FLA.—Materials for the extension and electrical equipment of the street railway will be purchased by Charles Sperry, superintendent, 12 West 31st street, New York, N. Y.

### Illinois.

ROCKFORD, ILL.—The Ogle county commissioners have granted a franchise to the Rock River Electric Railway Company.

ELMHURST, ILL.—The DuPage Interurban Electric Railway Company, which has been talked of for some time, is trying to get a franchise from the village of Elmhurst.

EAST ST. LOUIS, ILL.—The Belleville & St. Louis Electric Railroad Company, of which John A. Day is president, has received a franchise from the village of Winstanley.

ROCKFORD, ILL.—The explosion of a gasoline stove in the south barn of the Rockford City Railway, December 28, started a fire which destroyed the building and several cars. Loss, \$12,000; fully insured.

PEORIA, ILL.—The Peoria & Pekin Traction Company has paid \$5,000 for a site on which to erect a union depot in Pekin. The Pekin council now looks with more favor on the application for a franchise.

QUINCY, ILL.—J. C. Hubinger is said to be interested in a scheme to construct an electric road 146 miles in length, extending from Quincy to St. Louis, Mo. The cost is estimated at \$12,000 to \$15,000 per mile.

BELLEVILLE, ILL.—The Belleville & East St. Louis Electric Railway Company, of which John A. Day is president, will petition for a franchise to lay track the full length of West Main street. A large construction force is at work.

PEORIA, ILL.—The Peoria & Prospect Heights Railway Company has been incorporated to build and operate a street railway in Peoria, Tazewell and Woodford counties. Capital stock, \$100,000; incorporators, Walter Barker, president of the Central Railway, John L. Flinn and I. C. Pinkney.

### Indiana.

ANDERSON, IND.—Noah Clodfelter petitions for a franchise to build an electric railway from Summitville to Alexander and Elwood.

FORT WAYNE, IND.—Receiver M. S. Robison asks the court for a discharge, having presented a report. He asks \$20,000 compensation.

HUNTINGTON, IND.—A franchise for the use of Etna avenue has been granted to the Huntington Street Railway & Power Company.

GOSHEN, IND.—The recently incorporated Elkhart, Goshen & Southern Railroad Company has received a franchise from the county commissioners. The road is to be built within a year.

CONNERSVILLE, IND.—The Connersville Street Railroad Company has been incorporated. Capital stock, \$25,000; directors, Charles Mount, Thomas Downs, E. M. Ansted, Daniel Roots and G. C. Florea.

SOUTH BEND, IND.—The attempt to have the charter of the South Bend & Mishawaka Street Railway Company annulled has failed, Judge Hubbard holding that the property is in better condition than when acquired by the company.

GOSHEN, IND.—The Elkhart, Goshen & Southern Railway Company has been incorporated to build an electric road connecting the cities of Elkhart and Goshen and Lake Wawasee. Capital stock, \$250,000; directors, William H. Holcomb of Chicago, H. D. Judson and N. J. Aldrich of Aurora, Ill.

ANDERSON, IND.—George F. McCulloch, secretary and treasurer of the Citizens' Street Railway, Muncie, it is said, has joined C. L. Henry, of Anderson, and Philip Matter, of Marion, in a plan to build a road connecting Muncie with Anderson and passing through Chesterfield, Daleville, Yorktown, West Muncie, and the Spiritualists' camp grounds, with a branch at Linwood extending to Florida Station. The Gas Belt Electric Railway, built by Henry and Matter, is about ready for operation.



## Iowa.

CEDAR FALLS, IA.—The Patton motor has been given a test on the new street railway.

DES MOINES, IA.—The Des Moines City Railway Company contemplates a change in routes that will necessitate the laying of a mile of new track.

COUNCIL BLUFFS, IA.—Superintendent W. S. Dimmock of the Omaha & Council Bluffs Railway & Bridge Company will within the next 90 days buy a 325 or 400-k. w. direct connected generator and a corliss engine to correspond. Mr. Dimmock also expects to purchase 16 equipments of large motors for the interurban traffic between Omaha and Council Bluffs, to be placed under 43-ft. car bodies.

## Louisiana.

LAKE CHARLES, LA.—Adolph Meyer, president of the Lake Charles Street Railway Company, says his company will equip with some electric system, starting with ten cars.

## Maine.

BANGOR, ME.—The erection of a new power house is contemplated for the Bangor, Orono & Oldtown Railway and the Penobscot Central Railway.

SACO, ME.—Surveys have been completed for the Saco River Electric Railway. Contracts for construction will be let by Francis A. Hobart, 4½ Beacon street, Boston, Mass.

BRUNSWICK, ME.—The Lewiston, Brunswick & Bath Electric Railroad Company has been formed at Brunswick to build a road the coming spring. A. M. Shaw, Bath, president; A. F. Gerald, Fairfield, vice-president and general manager; Elias Milliken, Augusta, treasurer.

## Maryland.

ELKTON, MD.—Stockholders of the projected Cherry Hill, Elkton & Chesapeake City Electric Railroad have re-elected Dr. Frank H. Mackey president, and Charles H. Smith secretary and treasurer. A bill will be presented to the legislature asking that the \$58,000 credited to the Elkton & Southern Railroad be transferred to the Cherry Hill Company. The right of way will be obtained early in 1898.

## Massachusetts.

WORCESTER, MASS.—The Worcester & Clinton Street Railway Company will let contracts for 12 miles of road. A. S. Paton of Leominster is president.

RIDGE HILL, MASS.—The Hanover Street Railway Company has decided to postpone the extension of its lines from Assinippi to Norwell Centre to next spring.

LOWELL, MASS.—Negotiations are pending for the purchase of the Newburyport, Amesbury & Plum Island Electric Railway by the Lowell, Lawrence & Haverhill Company.

SPRINGFIELD, MASS.—Wilson C. Reynolds, who has furnished ties valued at \$4,182, asks the appointment of a receiver for the Springfield & Southwestern Electric Railway, now under construction. J. W. Starr, the general contractor, says there will be no difficulty about the payment of any debts.

TAUNTON, MASS.—James F. Shaw, H. Fisher Eldredge, P. W. Sprague and W. Sumner Minds are interested in a project to build an electric railway from Taunton to Rhode Island by way of Dighton, Rehoboth and Seekonk. The Bristol County court is asked to grant authority to construct the line.

FALL RIVER, MASS.—The Tiverton council has granted a franchise to the Fall River & Stone Bridge Railroad Company to build an electric railway, being a section of the road by which Tucker, Anthony & Co., of Boston, expect to connect Fall River and Newport, R. I. December 14 the town of Portsmouth granted a franchise to the same parties. The opposition of wealthy summer residents at the seaside town, headed by Cornelius Vanderbilt and A. C. Taylor of New York, was unavailing.

MARLBORO, MASS.—Tucker, Anthony & Co., of Boston, are financing the Framingham, Southboro & Marlboro Street Railway Company. This 10.5 miles of road will be a connecting link between Boston and Worcester.

BOSTON, MASS.—The Ferry street car house of the West End Street Railway at Everett was burned December 24, together with 87 cars. The cause is unknown, except that it was not electrical. Loss, \$200,000, fully covered by blanket policy.

## Michigan.

PONTIAC, MICH.—The Oakland Electric Railway has been placed in operation.

OWOSSO, MICH.—The Owosso & Corunna Traction Company has been ordered to repair its track within 30 days under penalty of forfeiting its franchise.

MENOMINEE, MICH.—A. A. Carpenter has sold the greater part of his street railway stock to A. Spies, G. A. Blesch, J. Henes, S. M. Stephenson and E. Daniell.

DETROIT, MICH.—J. E. Tucker, of Mt. Clemens, receiver of the Detroit & St. Clair River Railway, has been authorized to issue \$60,000 of certificates for construction.

BAY CITY, MICH.—The Bay Tuscola & Huron Railway Company has been incorporated to build an electric road from Bay City to Sebawaing. Capital stock, \$100,000.

DETROIT, MICH.—J. R. Trufant and stockholders of the Rapid Railway are talking of an electric road five miles long, to run from the Clinton River bridge to Huron Pointe.

ADRIAN, MICH.—A. P. Southworth, a former motorman, has bid in the Adrian Street Railway at receiver's sale for \$1,200. It is said the Page Wire Fence Company is interested.

BENTON HARBOR, MICH.—The Benton Harbor & Eastman Springs Railway has been placed in operation, in connection with St. Joseph & Benton Harbor Electric Railway.

DETROIT, MICH.—Hoyt Post, of Wilkinson & Post, attorneys, says that the electric railway in which he, Seymour Brownell and other capitalists are interested, will not be built unless farmers owning land along the right of way give a bonus of \$10,000.

MT. CLEMENS, MICH.—The suit brought by the Mt. Clemens & Lakeside Traction Company against the Detroit, Lakeshore & Mt. Clemens Railway Company is only to clear title, the latter company, which never owned the property, having given a mortgage.

HOLLAND, MICH.—Residents of Holland have received \$7,000 in payment of their claims from J. E. Cochran, Jr., of Chester, Pa., the capitalist who took up the violated contract of Foster & Louis, of Chicago, and saved the franchise granted the Holland & Lake Michigan Electric Railway Company from being revoked.

LANSING, MICH.—The Lansing, Dexter & Ann Arbor Electric Railway Company has been organized to build an interurban line. Capital stock, \$250,000; directors: President, C. A. Mapes, Lansing; vice-president, R. J. Shanks, Lansing; secretary, Charles W. Taylor, Lansing; treasurer, Thomas Berkett, Dexter; Morris Topping, of Plainfield; L. C. Chase, of Danville, and C. P. Black, of Lansing.

LANSING, MICH.—The Lansing, St. Johns & St. Louis Railway Company, organized for the purpose of building an electric railroad from Lansing to St. Louis, a distance of about 50 miles, has elected the following officers: President, M. V. Montgomery, Lansing; vice-president, A. P. Darragh, St. Louis; secretary, Frank L. Dodge, Lansing; directors, Jacob Stahl, M. V. Montgomery, Lansing; A. B. Darragh, Stiles Kennedy, St. Louis; Isaac Hewitt, Maple Rapids; George D. Stone, Ithaca.

DETROIT, MICH.—Alexander E. Riopelle, C. W. O'Brien and Julius Freud of Detroit promise to have the Detroit & Toledo Electric Railway in operation by July 1. The last of the right of way has been

obtained. The line will pass through Ecorse, Trenton, Gibraltar, North Rockwood, South Rockwood, Berlin, Brest, Monroe, Lasalle, State Line, Manchester, West Toledo and Toledo. Steel bridges will be built across the River Rouge, the Huron and Raisin rivers, and at Swan Creek, Lasalle and Erie. The power house will be located at Newport. Passenger cars will be run every hour and an entrance to Detroit will probably be made over the tracks of the Fort street road. The rate of fare has been fixed at one-half of that charged by the steam roads.

### Minnesota.

ALBERT LEA, MINN.—George L. Carrington and other local capitalists will ask a franchise to build an interurban electric railway from Albert Lea to Geneva, passing through Bancroft and Clark's Grove. Passengers, freight and mails will be carried.

### Mississippi.

VICKSBURG, MISS.—Two propositions for street railroad franchises have been made to the city council by rival promoters, Percival Steele and J. P. Tracy. The Hon. Patrick Henry is interested.

JACKSON, MISS.—The organization of the company which is to build the electric railway has been completed and construction will be pushed. Mayor R. E. McKisson of Cleveland, O., has been elected president, H. C. Ellison, vice-president, and Samuel G. McLure, secretary and treasurer.

### Missouri.

ST. LOUIS, MO.—The council has killed the Cabanne Place Railway bill.

ST. LOUIS, MO.—It is said the Baden Electric Railway will be extended to the Chain of Rocks.

ST. JOSEPH, MO.—Vestibules are rapidly being placed on all the cars in compliance with the city ordinance.

ST. LOUIS, MO.—Rumors are afloat anent a consolidation of the Lindell and the Missouri Railroad systems.

ST. LOUIS, MO.—L. M. Rumsey petitions the court to remove Charles Green as the receiver of the People's Railway Company.

KANSAS CITY, MO.—The Metropolitan Street Railway Company has applied to the county court for right of way for the electric road from Washington park to Fairmont park.

KANSAS CITY, MO.—The Kansas City, Lawrence & Topeka Electric Railway & Power Company has been incorporated with \$3,000,000 capital stock, to build an electric freight and passenger line.

HANNIBAL, MO.—The Hannibal Street Railway Company has taken hold of the project to build an extension to Palmyra. The city lines will also be rebuilt and a steam heating system installed.

ST. LOUIS, MO.—The Midland Railway Company, which is controlled by the Lindell Railway Company, has agreed with the Overland Real Estate Company to extend its lines from Creve Coeur Lake to the limits of St. Louis, in consideration of \$10,000 in cash, 100 shares of its stock, a 50-ft. right of way and five acres of land.

HANNIBAL, MO.—The Hannibal Street Railway and all property pertaining thereto was sold December 14 under foreclosure of mortgage to Colonel John H. Garth, president of the Farmers and Merchants Bank. The price paid was \$13,500. The road is said to have been losing money ever since the old management disposed of it over a year ago.

KANSAS CITY, MO.—The incorporators of the Kansas City, Lawrence & Topeka Electric Railway Company are E. B. Purcell, of Manhattan; John G. Johns, of Houston, Texas; Henry McGrew and W. L. Wood, of Kansas City, and Edward E. Holmes, James Haggard and A. N. Gossett, of Kansas City, Mo. E. B. Purcell is at the head of the concern, representing a syndicate of eastern capitalists.

KANSAS CITY, MO.—The Kansas City, Forest Lake & Bonner Springs Railway Company has been incorporated to build a double

track electric road 20 miles in length, from Kansas City to Bonner Springs, a summer resort. Capital stock, \$250,000; directors, John W. McDaniel of Bonner Springs, Rudolph Markgrof and W. S. Campbell of Kansas City, Mo., and Charles A. Ebert and C. F. Hutchings of Kansas City, Kan. The Northeast Electric Railway Company is arranging to invade the territory of the Metropolitan Street Railway. Superintendent Weaver says that three routes are being considered and that within 120 days the company will be landing passengers at the corner of 11th and Main streets.

### Nebraska.

LINCOLN, NEB.—The Lincoln Traction Company has been incorporated to operate the reorganized Lincoln Street Railway. Capital stock, \$1,065,000; incorporators, M. L. Scudder of New York, William Belcher of New London, Conn., and J. H. Ames, D. D. Muir and E. F. Pettis of Lincoln.

LINCOLN, NEB.—The property and franchises of the Lincoln Street Railway were sold December 17, by a master in chancery to representatives of the first and second mortgage bondholders for \$60,500, subject to paying taxes of more than \$40,000. The holders of the \$300,000 of first and \$840,000 of second mortgage bonds are M. L. Scudder of New York, Judge William Belcher of New London, Conn., and other Eastern capitalists. The road, consisting of 55 miles of track, during the past three years has been operated by a receiver, Brad D. Slaughter, who has devoted the small surplus earnings to paying off back taxes and other pressing liabilities.

### New Jersey.

MONMOUTH, N. J.—Those interested in the recently incorporated Monmouth Traction Company are Edward Morrell of Philadelphia, H. V. Massey and Mitchell B. Perkins of Beverly, Pa., and A. B. Stoney of Keyport. The Company has purchased and will equip electrically the horse car line between Keyport and Matawan.

PERTH AMBOY, N. J.—The Perth Amboy & Sewaren Electric Street Railway Company has been incorporated to build a road. Capital stock, \$25,000; incorporators, Cassimer W. Boynton, Woodbridge, N. J.; Henry Maurer and Robert W. de Forest, New York, N. Y.; Garret Brodhead, Patrick Convery, C. Whitman Boynton, Jr., and John Pfeiffer, Jr., Perth Amboy.

JERSEY CITY, N. J.—John L. Heins, president, has been appointed receiver of the New Jersey Electric Railway, known as the "White Line," on application of the Mercantile Trust Company of New York. The company was established in 1894, with a capital of \$10,000,000, to consolidate several roads and has a line in Passaic City and another running from Hoboken to Secaucus and besides controls leases of the Jersey City, Hoboken & Rutherford Railway and the Paterson, Passaic & Rutherford Railway and Idlewild Park. The immediate cause of the receivership was a default in the interest on \$3,500,000 of the first mortgage bonds.

### New York.

NYACK, N. Y.—The Nyack Traction Company, A. B. Wilgus, promoter, has been granted a franchise by the trustees of South Nyack.

NEW YORK, N. Y.—The park commissioners have resolved that the charter of the Union Railroad Company be annulled and its tracks torn up.

GREENBUSH, N. Y.—J. M. Sullivan & Co., who have the contract to construct the Greenbush & Nassau Electric Railway, it is said, will soon resume work.

STATEN ISLAND, N. Y.—The Staten Island Midland Railroad Company has received a franchise for the Tottenville branch and the loop line through Pleasant Plains.

ONEONTA, N. Y.—The contract for constructing the car house and power plant of the Oneonta & Otego Valley Railroad, has been awarded to Andrew Douglass of Binghamton.

BUFFALO, N. Y.—Plans for new lines have been filed with the board of public works by the Buffalo Traction Company. Work is to begin as soon as weather will permit in the spring.



NEW YORK, N. Y.—Mayor Strong has vetoed the Pelham Park Railway Company's franchise, and the aldermen have been permanently enjoined from passing it over the mayor's veto.

BROOKLYN, N. Y.—The property of the Brooklyn Cable Company was sold under foreclosure, December 23, to John C. Breckenridge, chief engineer of the Brooklyn Rapid Transit Company.

NYACK, N. Y.—Frank Demarest has obtained a franchise for the company which will build an electric railway from Rockland Lake through West Nyack and South Nyack to the Bergen county line at Tappan, paralleling the Northern Railroad of New Jersey.

NEW YORK, N. Y.—The Metropolitan Street Railway Company and the Third Avenue Railroad Company have settled all their differences, it is said, thus enabling the latter to immediately install the conduit system on 42d street, the Boulevard and the entire Dry Dock system.

MT. VERNON, N. Y.—The Union Electric Railway Company will extend its Fifth avenue line from Mount Vernon to Bartow and City Island; the company has also under consideration the construction of a trolley road over the abandoned route of the North Mount Vernon Horse Railroad Company, through Chester Hill to the county seat at White Plains.

WATERTOWN, N. Y.—The Black River Traction Company has been formed to reorganize the Watertown & Brownsville Street Railway, recently sold under foreclosure. Capital stock, \$65,000; directors, Julius A. Leucher, George Krentz and Chandler W. Riker of Newark, N. J.; B. Van Wagenen of South Orange, N. J.; Hiram F. Inglehart, Byron B. Taggart and George H. Walker of Watertown.

SYRACUSE, N. Y.—The Onondaga Lake Railroad Company is the second to make application for right of way for an electric line through Baldwinsville. The directors are the following influential business men of Syracuse: Wing R. Smith, Edward Joy, James M. Belden, P. R. Quinlan, E. A. Powell, John S. Kaufmann, H. N. Babcock, W. Judson Smith, A. R. Peck, Herman Bartels, Charles M. Warner and Louis House.

SOUTHFIELD, N. Y.—The New York Beach Railroad Company has been incorporated to build five miles of electric street railway in the town of Southfield, Richmond county. Capital stock, \$50,000; directors, Albert Reynand, of New Dorp. S. I.; Ernest G. Wightman, of Stapleton, S. I.; Charles N. Harris of No. 35 Nassau street; William B. Welde, William D. Stratton, Robert Emmet, H. T. Ferris. A. S. Drake and James P. Egan of New York City.

YONKERS, N. Y.—The Hudson River & Long Island Sound Railway Company has been incorporated to build 10 miles of electric road from Yonkers to Pelham Manor. Capital stock, \$100,000; incorporators, Henry C. Bassett, Washington; Henry A. Welch, Detroit; James F. Secor, Jr., Pelham Manor; D. B. Halsted, Paul Gorham, and John H. Seed, Brooklyn; Seward Baker and Walter R. Quick, New York, and William L. Stout, Elizabeth, N. J.

DELHI, N. Y.—A scheme is on foot with good backing to build 15 miles of electric road between Delhi, Bovina Centre and Andes. A company, to be known as the Delaware Valley Railroad Company, is now being formed by James F. Scott and William C. Oliver of Andes; Thomas E. Hastings and Alexander Hilson of Bovina Centre; Hon. A. H. Sewell and H. S. Sewell of Walton; Hon. Henry Davie, Charles E. Hitt and Samuel P. Wilber of Delhi.

BROOKLYN, N. Y.—The United Railroad Company has been incorporated as a reorganization of the Brooklyn Cable Company, whose property was recently sold to John C. Breckenridge. The capital stock is \$300,000. The directors are: Henry C. Barrow, John M. Ward, Robert B. Smith, Henry Wyse and Walter F. Downs of Brooklyn, and Henry C. Evans, J. Clarence Farvey, Charles M. Bates and Frederick W. Bruckel of New York. Under the charter of the original company the new corporation is authorized to construct and operate a railroad in Brooklyn, between Fulton Ferry and the Cemetery of the Evergreens, on Front street, Fulton, Water, Washington, Concord and Navy streets, Park avenue, Broadway, Locust Park and Beaver street, Bushwick avenue, Jefferson street and Central avenue.

## Ohio.

ELMORE, O.—Dr. Teetzell, of Genoa, has applied to the council of Elmore for a franchise for an electric railway.

DEFIANCE, O.—On January 3, W. R. Faben, receiver, was ordered by the court to advertise the sale of the street railway property of the Defiance Light & Railway Company.

MASSILLON, O.—S. W. Goudy reports good progress on the electric railway scheme. It is soon to be incorporated as the Massillon, Dalton & Wooster Street Railway Company.

ZANESVILLE, O.—William Christy has been appointed receiver of the Zanesville Street Railway and the Zanesville Electric & Railway Company, on petition of the International Trust Company, which is foreclosing a mortgage of \$175,000.

ZANESVILLE, O.—Creditors and stockholders of the Zanesville Street Railway have decided to terminate the brief receivership, on a showing made by Receiver William Christy that the road is earning sufficient to meet all obligations.

DAYTON, O.—The county commissioners have extended the time for the completion of the Dayton & Western Traction Company's line from January 1 to February 1, 1898, on the allegation by the company that it was unable to procure ties.

CLEVELAND, O.—The Cleveland, Berea & Elyria Railway Company has been consolidated with the Elyria & Oberlin Electric Railway Company as the Cleveland, Berea, Elyria & Oberlin Railway Company. Capital stock, \$1,000,000; principal office, Berea.

NORWALK, O.—W. W. Graham, of Norwalk, and Clark Rude, of Sandusky, who hold a franchise to construct an electric railway from Norwalk to Sandusky, via Monroeville, have been granted an extension of time by the commissioners of Hume and Erie counties.

DAYTON, O.—The county commissioners have granted the petition of the Dayton, Springfield & Urbana Electric Railway Company for a renewal and extension of the franchise until October next. Some changes were made relative to cost of construction and maintenance of bridges.

YOUNGSTOWN, O.—The Mahoning Valley & Southeastern Railway Company has been organized to build the electric road as reported in the DAILY BULLETIN. John E. McVey, president; L. W. King, vice-president; C. Y. McVey, secretary, and A. A. Anderson, treasurer and general manager.

CINCINNATI, O.—The Cincinnati & Hamilton Electric Street Railway Company will build its line over the Hamilton turnpike during the coming summer. A franchise has been granted by the corporation of Mt. Healthy. Among those interested are: O. V. Parrish, J. C. Hooven and other citizens of Hamilton; C. T. McCrea, of College Hill, and ex-Mayor Caldwell, of Cincinnati. The Cincinnati & Miami Valley Traction Company is behind the enterprise and will ultimately control the entire route. Peter Schwab, brewer, of Hamilton, is one of the promoters.

## Pennsylvania.

SCRANTON, PA.—A car barn will be erected by the Scranton Traction Company, adjoining the power house.

KITTANNING, PA.—The Kittanning & Ford City Traction Company will be incorporated by James A. Gault, J. F. Hellman and others, to build a line between Rosston and Nealeton.

PITTSBURG, PA.—The Greensburg & Mt. Pleasant Street Railway Company has given a mortgage for \$200,000 to the Union Trust Company of Philadelphia. The road is to be built at once.

SOUTH BETHLEHEM, PA.—The South Bethlehem & Hellertown Electric Railway is to be extended with a branch line to Freemansburg. President Hugh Crilly also states that a car barn is to be erected.

WAYNESBORO, PA.—The Blue Ridge Electric Street Railway Company has been incorporated to build the 3.5 miles of road as reported in the DAILY BULLETIN of October 29. The capital stock is \$50,000, with \$5,000 paid in.

SHARON, PA.—A high speed engine and generator will be installed in the power house of the Valley Street Railway Company. Other improvements will be made. The company increased wages 12 per cent on December 15.

ELLWOOD CITY, PA.—The Park Gate & Ellwood City Street Railway Company has been incorporated to build three miles of electric road from Park Gate, Beaver county, to Ellwood City, Lawrence county. Capital stock, \$25,000; president, Thomas Dugan of Ellwood City.

ALLENTOWN, PA.—The Allentown & Emaus Street Railway Company has been incorporated to build an electric road from Allentown to Bethlehem, Mountainville and Emaus, with a branch line to Allentown. T. J. Crilly of Allentown is one of those interested; capital stock, \$50,000.

SHAMOKIN, PA.—Gibson & Rhinefelter of Philadelphia have purchased the franchises of the North Susquehanna Transit Company for an electric railway from Shamokin through Paxinos, Elysburg and Big Roaring Creek to Danville, Bloomsburg and Espy. Surveyors are in the field and construction is to begin in March. Orders for rails, it is said, will be placed with the North Branch Steel Works of Danville. The route will traverse one of the most picturesque regions of Pennsylvania.

LYKENS, PA.—The Lykens & Williams Valley Street Railway Company has been incorporated to build the electric road which has been promoted for several years. From Lykens to Johnstown, a distance of ten miles, the road takes in Wiconisco, Williamstown, Tower City, Reiner City and Bearmont. John B. Styles, Martinsburg, is president; C. C. Cocklin and W. E. Fletcher, Harrisburg; B. W. Brown, Derry Station, and W. E. Stewart, Indiana, directors. Dr. S. R. Ickes, of Harrisburg, is the largest stockholder.

### South Carolina.

CHARLESTON, S. C.—It is said that an electric road will be built by the Charleston & Seashore Railroad Company, just organized.

### Tennessee.

CHATTANOOGA, TENN.—Congress has referred to the committee on military affairs the bill granting S. W. Divine's Chattanooga Rapid Transit Company right of way through the Chattanooga National Military Park.

### Texas.

LAREDO, TEX.—An extension of 1.5 miles will be made by the Laredo Electric & Railway Company.

CORPUS CHRISTI, TEX.—The Council has granted the Corpus Christi Street Railway Company permission to tear up its tracks.

DALLAS, TEX.—At foreclosure sale the Dallas City Street Railway was bought in December 7, for \$267,000, by C. H. Alexander of Dallas and associates. The road, comprising 14 miles of horse and 10 miles of electric line, is to be largely improved.

### Vermont.

BARRE, VT.—The Barre & Montpelier Traction & Power Company has given a mortgage to the American Loan & Trust Company of Boston to secure \$100,000 of bonds.

BRATTLEBORO, VT.—E. C. Crosby of Brattleboro is one of syndicate which offers to build an electric railway 13 miles in length between Brattleboro and Northfield, Mass., via Hinsdale, N. H., provided the towns of Brattleboro and Hinsdale will construct two bridges across the Connecticut river.

BURLINGTON, VT.—J. S. Pierson, F. C. Kennedy and J. J. Flynn, all of Burlington, are interested in a project to build an electric railway connecting Fair Haven, Castleton, Hamden, Hydeville, Lake Bomoseen, Poultney, East Poultney and Middletown Springs.

### Virginia.

NORFOLK, VA.—The Norfolk Street Railway Company has been reorganized with Lancaster Williams of Richmond as president.

PORTSMOUTH, VA.—Right of way has been obtained for the River Front Railway, which will extend from Columbia Park to Gilmerton, and connect with the Portsmouth Street Railway.

LYNCHBURG, VA.—By a decree of the United States court the Lynchburg Electric Company is given until January 15 to pay its entire indebtedness; failing to do so, all its franchises and street railway property are to be sold to the highest bidder 30 days thereafter.

NORFOLK, VA.—Permission to build an electric railroad is asked by the Norfolk, Willoughby Spit & Old Point Railroad Company. H. L. Page and J. E. Cole, representing the company, says it contemplates purchasing the Ocean View road when it is put up for sale or building a power house and new road connecting the two ends of its property.

### Wisconsin.

RACINE, WIS.—The Belle City Street Railway has given a mortgage for \$250,000 to the Illinois Trust & Savings Bank, of Chicago.

JANESVILLE, WIS.—President Blabon offers to run the cars all winter, if local stockholders will pay their proportion of the expense.

OSHKOSH, WIS.—James K. Tillotson has practically completed arrangements to build an electric line to connect Oshkosh with Neenah, independently of the Fox River Valley Electric Railway.

WAUPACA, WIS.—Attorney Paul Sanborn, of Waukegan, Ill., is interested in the project to build an electric road. The city has granted a franchise, and right of way through Farmington is expected. One of the promoters is Robert D. Wynn.

MILWAUKEE, WIS.—All the property and franchises of the Milwaukee & Wauwatosa Motor Railway Company, the North Greenfield & Wauwatosa Electric Railway Company, the Waukesha Electric Railway Company and the Waukesha Beach Electric Railway Company, were, December 10, conveyed to the Milwaukee Light, Heat & Traction Company, which is the successor to the Pabst Power & Light Company, and is owned by the Milwaukee Electric Railway & Light Company, although a separate organization. The Traction Company now owns and controls both lines from the city to Wauwatosa, as well as the motor line to North Greenfield, the prospective electric line to Waukesha from North Greenfield, and the Beach line. This property will be operated for the Traction Company by the Milwaukee Electric Railway and Light Company.

### West Virginia.

WHEELING, W. VA.—B. W. Peterson and W. E. Stone, directors of the Wheeling Street Railway Company, are negotiating with the council of Martin's Ferry, O., for the privilege of extending their road.

WHEELING, W. VA.—A franchise has been granted by the county commissioners to the Wheeling & Elm Grove Railway Company for an electric street railway. Ordinary T rails are to be laid. Construction of the road will begin probably in the spring.

SISTERSVILLE, W. VA.—The Sistersville & Salem Railroad Company has been incorporated to build an electric line from Sistersville, on the Ohio River, to Salem, by way of Middlebourne, through the richest part of the oil fields. Both passengers and freight will be carried. Capital stock, \$500,000.

### Canada

NAPIERVILLE, QUE.—Napierville and the parish of St. Cyprian have voted a bonus of \$10,000 to the Southern Counties Electric Railway Company.

ST. THOMAS, ONT.—Ratepayers have voted in favor of the law to guarantee \$50,000 of the bonds of the street railway, which promises to build 6.5 miles of track.



## ELECTRICITY ON THE HOBOKEN SHORE ROAD.

The use of electricity for switching purposes on the steam railroad, in place of the noisy drill steam engine, takes another step forward. This time on the Hoboken Shore Road, Hoboken, N. J. The full name of this road is the Hoboken Railroad, Warehouse & Steamship Connecting Company. It runs from 17th street, Weehawken, to 4th street, Hoboken, along the water front, or from the Erie tracks at Weehawken to the docks of the North German Lloyd Steamship Company, Hoboken, a distance of about two miles.

This road was opened for traffic on September 20, 1897. It was constructed to provide connecting facilities between the tracks of the railroad companies entering Hoboken and the numerous warehouses and docks which line the west

bar pull is 10,000 lbs. The locomotive is driven through a single reduction gear of very low ratio. The speed is correspondingly low, and is rated at 8 miles an hour when hauling a heavy load.

The overhead wire is No. 00 suspended from wires strung between octagonal cedar poles, except at two or three points, where bracket construction is used. Where the locomotive turns in from Hudson avenue to the River Walk, a peculiar condition has caused a special method of bracket construction. It was necessary for the overhead line to be so set as not to infringe upon the limit of the next property. Thus at this point the overhead line is suspended from two bracket arms, one 6 ft. and the other 18 ft. long.

The current for the road is taken from the station of the Hudson Electric Light Company.

The Hudson Shore Road is one of the sub-companies of the Hudson Land & Improvement Company, organized



ELECTRIC LOCOMOTIVE FOR HOBOKEN SHORE ROAD.

side of North river from Hoboken to Weehawken. It is double track over a private right of way from 17th to 14th streets, single track down Hudson street to 11th street, and double track along the river walk to 4th street, Hoboken.

The switching of the cars for the past three months has been effected by a repair car of the Hudson County Electric Railroad Company. The new locomotive was put into regular service on January 4, 1898, hauling trains of loaded and empty freight cars between the docks and the Erie track.

The locomotive was constructed in the shops of the General Electric Company, at Schenectady, N. Y., and somewhat resembles in appearance the electric locomotive in use on the Manufacturers' Railroad, which connects with the N. Y., N. H. & H. R. R. tracks at New Haven, Conn., and those of the Baltimore & Ohio Railroad, at Baltimore. It is mounted on two four-wheel trucks, each axle carrying a G. E. 2,000 motor, giving the locomotive a total of 540 rated h. p. The weight on the drivers is 57,200 lbs.; the draw

52 years ago, under a special charter, by the Stevens family, to consolidate their interests in their several Hoboken properties. The present head of the Stevens family, Col. Stevens, is president, and Robert L. and Richard Stevens are respectively first and second vice-presidents; the general manager and treasurer is Palmer Campbell, and the secretary W. A. Macey.

The trial trip of this locomotive was witnessed by representatives of all the railroads having offices or termini in New York and New Jersey. The locomotive was coupled to eight loaded freight cars with an aggregate dead weight of 205.6 tons. It handled this train with ease. It was then coupled to a number of passenger coaches, and the party made the journey over the line from Hoboken to Weehawken and back.

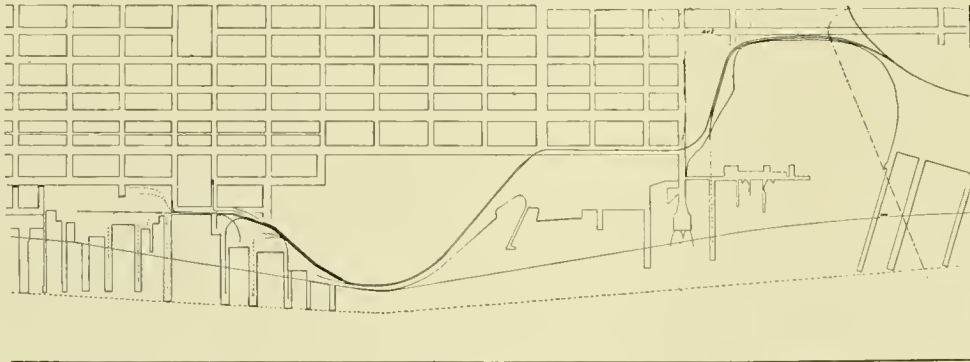
At the luncheon which followed, two interesting speeches were made. F. Le Bau, general freight agent of the West Shore Railroad, pointed out emphatically the usefulness of such a road as the Hoboken Shore Road in facilitating the

transport of merchandise directly from the steamships to any part of the country, and of the rapid switching electric locomotive, by means of which the freight cars could be handled more easily and more expeditiously than with the ordinary steam drill engine. W. J. Clark, general manager of the railway department of the General Electric Company, in an interesting talk full of reminiscences of the early days of the street railway struggle, said:

"Ten years ago, the development of three things made electric street railways practicable and profitable. These were the under-running trolley, the carbon brush and the modern method of motor suspension. The development of three other things now renders the general application of electricity to standard railroads both possible and probable. These are the safe breaking of heavy currents, high voltage for their transmission and methods for their application to almost any load on any portion of a line. Other features are being developed that will seriously affect the result; not the least is the Sprague system of multiple and unit control, increasing the flexibility of the already most elastic of all transportation agents, and while the economy

extended system of suburban and interurban electric roads in densely populated districts also feeding the main lines.

"The electrical engineer has much to learn from the steam railroad man, and must constantly rely upon him for suggestions as to the best methods of making practical applications of electricity. The American transportation man and the American electrical engineer should go on hand in hand, continuing to lead the world, as they now do, in all transportation problems. The American engineer has won conquests abroad as well as at home; not the least is the solution of the problem of electrical equipment for the Central London Underground Railway, the most important of this character that has yet been accomplished. The American engineering plans were selected on account of their merit in the face of the severest competition from every European electrical manufacturing company, and no greater tribute can be paid to American engineering methods than to state that 80 per cent of all the railway apparatus used in Europe is designed in America, so that the American engineer stands today head and shoulders above those of any other country. With the encouragement of the co-



MAP OF HOBOKEN, N. J. HORE ROAD.

of electricity has already been thoroughly demonstrated in performing the same service as by steam or animal traction, so far as passenger service at least is concerned, something beyond the mere question of economy has now to be considered, to wit: accomplishment by electrical methods of what would be entirely impossible with steam. The first steam railway man within my range of acquaintance to fully grasp this idea is John Lundie, consulting engineer of the Illinois Central Railroad, who has set a pace on acceleration that would not have been dreamed of two years ago, and the schedule which he has mapped out for the contemplated electrical equipment of the suburban lines of his company involves speeds up to 40 miles per hour in 20 seconds. That this is practical has already been demonstrated.

"In another direction even greater changes may be prophesied which will come from the adoption of electricity in standard railroading, viz.: the lengthening of freight trains and the consequent reduction in that most important feature of operating expense, transportation wages. The advantages of electricity will have so thoroughly demonstrated themselves in the directions suggested that instead of main steam lines with electric feeders, in 10 years it will be a question of electrically operated main lines with steam feeders through the sparsely settled districts, and a more

operation of American railroad men, he is bound to revolutionize the entire method of transportation within a comparatively short space of time, so that American railroad methods will then, as now, be in advance or those existing anywhere else on the face of the earth."

#### IN THE HANDS OF RECEIVERS.

According to a compilation made by the United States Investor there are 64 street railways yet in the hands of receivers, as the result of the financial depression during the last three years. These 64 roads have an aggregate bonded and floating debt of \$40,608,826, own 958.3 miles of track and 1,910 cars. It thus appears that the insolvent companies own a trifle more than 6 per cent of the total track mileage of the country, less than 4 per cent of the cars, and that the debt is about 6 per cent of the total of street railway bonds outstanding.

The will of David W. Dickson, late president of the Philadelphia Traction Company, has been probated. The estate is estimated at \$200,000 and upwards. The final disposition of the greater part of the property is to the Old Man's Home, and, failing that, to the Episcopal Hospital of Philadelphia.



## PERSONAL.

W. T. Van Dorn is east on a business trip and will be gone for a month or more.

A burglar robbed the residence of J. R. Wooden, president of the People's Street Railway, Centerville, Ia., on the evening of December 23.

President A. Radel, of the Bridgeport Traction Company, is the proud father of twins, a boy and a girl, who came as a New Year's greeting.

At the annual meeting of the New Orleans Traction Company, Limited, held January 3, C. D. Wyman was re-elected general manager for another year.

F. B. Ward, of Kansas City, Mo., has accepted the position of shop foreman for the electrical and mechanical equipment on the Lake Street Elevated Railroad, of Chicago.

Clark Rude, receiver of the Sandusky (O.) Street Railway Company, and Andrew Thompson, superintendent, were on Christmas presented with handsome office chairs by the employes.

James Todd, president of the Sterling Varnish Company, was married to Miss Mary Louise Slagle, daughter of Judge Slagle. The best wishes for a long and prosperous married life are offered to the happy couple.

P. V. Burington, secretary and auditor of the Columbus (O.) Street Railway, recently lectured to the class in transportation at the Ohio State University on the subject of "The Financial Management of Street Railways."

S. Roy Wright, on December 31, resigned his position as general manager of the West End Street Railway, Denver, and is now installed as secretary of the Board of Education, School District No. 1, of Colorado, with headquarters in Denver. While out of the street railway business, Mr. Wright still considers himself one of the fraternity.

The employes of the Bristol (Conn.) & Plainville Tramway Company gave a smoker in honor of C. D. Shepard, who has accepted the position of general manager of the Palmer & Monson Tramway Company. Mr. Shepard received a present of a gold watch and seal charm from the officers and employes.

W. S. Freeman, while a motor inspector for the Milwaukee Electric Railway & Light Company, became involved in trouble and was imprisoned. Lately he forged his brother's name and has been sentenced to a term in the penitentiary. He endeavored to commit suicide while leaving the court room in Chicago.

On January 1, F. W. Fratt assumed his duties as engineer and superintendent of the Galveston (Tex.) City Railroad. Mr. Fratt has been engaged in steam railroad work ever since leaving college in 1881. At one time he was chief engineer of the Wisconsin Central lines; his last position was superintendent of the Texas Midland.

DeWitt Dilworth, who a short time since resigned his position as secretary of the New Castle (Pa.) Traction Company and the allied companies, was on the occasion of his leaving presented with a handsome gold watch by the employes.

Russel B. Harrison, president of the Terre Haute street railway, was a "Review" caller. He is making a splendid record in the face of the most aggravating difficulties, and has the hearty support of the public, his men, and in fact everybody but an obstreperous old mayor, who has done the city more harm in two years than he can possibly do good in twenty.

David W. Dickson, president of the Philadelphia Traction Company, died suddenly of a complication of heart troubles, December 13. Mr. Dickson was born in Philadelphia 63 years ago and has been identified with street railway interests since 1878. He was first treasurer of the West Philadelphia Passenger Railway Company, and later when P. A. B. Widener retired from the presidency of the Philadelphia Traction Company, Mr. Dickson succeeded him.

## NEW PUBLICATIONS.

With the first issue of the year the Electrical Review has taken a new form and size, presenting a handsome appearance. The page has been reduced to more convenient dimensions and the typographical work much improved.

We have just received the verbatim report of the sixth annual meeting of the Pennsylvania Street Railway Association, which was held at Allentown, Pa., on September 1 and 2. In addition to the papers presented, which were published in the "Review" for September, the report of the committee on legislation and the subsequent discussion will be found very interesting. Secretary Light is to be congratulated on the handsome appearance of the report.

"Street Railways of Greater New York," is a pamphlet of 72 pages prepared by Redmond, Kerr & Co., bankers, of New York and Philadelphia, which will prove valuable for reference. It gives a description of the surface street and elevated railways of Greater New York with particular reference to the securities, etc., of the several companies, the facts and figures being taken from official sources wherever possible. A comparative statement of the business and earnings of each company for the last two years is given.

The B. F. Sturtevant Company, of Boston, has just issued an octavo volume of nearly 400 pages entitled "Mechanical Draft," a practical treatise on that subject, representing the accumulated experience of the Sturtevant Company; also Walter B. Snow has devoted nearly two years to a special investigation of the subject. The objects are thus stated in the preface: First, to instruct by a lucid discussion of the entire subject, with such supplementary information as may be necessary to show the superiority of mechanical draft. Second, to show the special adaptability of the Sturtevant fans for this purpose, and to indicate to some degree the extent to which they have already been applied. The work brings the subject down to date in all the fields of engineering and is well worth a careful perusal.



The R. D. Nuttall Company, Allegheny, remembered its friends and customers with a neat calendar.

The Bradford Belting Company, Cincinnati, sent to its friends and customers a handsome wall calendar.

The Central Electric Company, of Chicago, has established an office in New York with Ira Abbott in charge.

Alfred F. Moore, manufacturer of insulated electric wire and cables, is distributing a very handsome calendar to the trade.

The Cleveland Leader is authority for the statement that the Walker Company contemplates the removal of its plant to New York.

The Western Electric Company is manufacturing a non-sparking brush, made of a composition of high and low resistance metals.

Harold P. Brown has received an order for 10,000 plastic bonds from the Dublin United Tramways Company, this being the third order.

Henry L. Shippy, of John A. Roebling's Sons Company, has sent a gold plated pocket cork screw to his many friends with New Year's greeting.

The Western Electric Company is placing on the market an ornamental enclosed arc lamp similar to the standard enclosed lamp but finished in polished brass.

One of the first of the 1898 calendars to arrive was that from the Dorner & Dutton Company, Cleveland, manufacturer of gears, pinions, wheels, axles, trucks, etc.

The Swarts Metal & Refining Company, of Chicago, has received a large order from Japan for brass ingots, which is the first contract of that kind in the foreign market.

John T. McRoy, Chicago, of conduit fame, remembered his customers, on New Years, with a fine fountain pen of excellent quality—a most acceptable souvenir to anyone.

The Jackson & Sharp Company in the latter part of December shipped to the Syracuse & Suburban Railroad, Syracuse, N. Y., seven of the cars ordered by that road.

B. F. Sweeten & Son, of Camden, N. J., are building the trolley line between Quakertown and Hellertown, Pa. The road is 14 miles long and the contract price is \$127,000.

J. A. Fay & Co., of Cincinnati, have been awarded the contract for furnishing the wood-working machinery for the new shops of the Cincinnati, Hamilton & Dayton Railroad Company at Lima, O.

J. H. Leonard & Co., of Pittsburg, Pa., eastern agents of the Swarts Metal & Refining Company, have again renewed their contract to look after the latter's interests.

The Sterling Supply & Manufacturing Company, of New York, reports that its business is in first class shape, large orders having been received lately from both old and new customers.

The Leschen-Macomber-Whyte Company, Chicago, maker of bare and insulated wires, and flattened strand wire rope, issued a pretty calendar with handsome photo-gravure fishing scene.

McGill & Pomeroy, Chicago, general western sales agents for a large line of railway specialties, are mailing customers and friends an unusually attractive calendar with steel plate figure engraved thereon.

The calendar which the W. H. Sills Company of Chicago, dealer in mica, sent to its friends bears a very handsome reproduction of the American flag in red, white, blue and gold which is a fine piece of work.

The Barney & Smith Car Company, Dayton, O., is doing a good business, and such a large number of orders has been received recently that it was necessary to increase the working force to 1,000 men.

The J. G. Brill Company recently shipped a number of closed vestibuled cars to the Woronoco Street Railway Company, Westfield, Mass., which will be put in service as soon as the motors and controllers are in place.

F. C. Randall, representing the Christensen Engineering Company, in the east, came on to attend the meeting for the organization of the Illinois Street Railway Association. He received a warm welcome from his many friends.

We have received the advance sheets of a most artistically designed catalog soon to be issued by the Sargent Company, Chicago. It is on the subject of brake shoes and includes the tests recently made of the "Diamond S" shoe.

The Metropolitan Street Railway Company, of Kansas City, tried the Pintsch system on its Westport line and the test was so satisfactory that the cars on the Holmes and 15th street lines will now be lighted in the same manner.

Elmer P. Morris, of 15 Cortlandt street, New York, is the manufacturer's agent for street railway materials of every description. His catalog No. 5 is a book of 136 pages, fully illustrated and containing a complete price list.

Gill & Co., of Philadelphia, have received the contract for the overhead work on the Red and White lines of the City Passenger Railway, Baltimore, Md. With this change the last of the cable roads of Baltimore will be superseded by electricity.

The Standard Paint Company states that its orders are increasing from all parts of the country. The company is now paying especial attention to the P. & B. tape and rubberoid motor cloth, and makes the offer to send to any street



railway company a motor curtain free of charge for trial. The "universal" coating is a preservative paint which is without an equal for conduit and general iron work.

The General Electric Company has published from its own press a general catalog on incandescence lamps which is not only a valuable treatise on the subject and full of information, but its typography and illustrations make it a model in this kind of work.

The DeWitt "common sense" sand box, made by E. F. DeWitt & Co., Lansingburg, N. Y., has been received with great favor by a large number of street railway companies. From the new and duplicate orders a large business is anticipated for the coming year.

The West End Street Railway Company, of Boston, has received five Taunton snow plows, through the agency of Wendell & McDuffie, of New York. This duplicate order makes a total of 13 plows received this year, and is a strong testimonial of their efficiency.

The Joseph Dixon Crucible Company presented its editorial friends with a most acceptable Christmas gift, a box of pencils, crayons and erasers. The utility of the remembrance will keep the generosity of the company constantly before those who were so fortunate as to be favored.

The Washburn & Moen Manufacturing Company, of Worcester, Mass., Waukegan, Ill., and San Francisco, Cal., has recently mailed from the Houston, Tex., office, which is in charge of George A. Cragin, a leather coin bag so that all its friends may be prepared for the prosperous year that is coming.

The firm of Herrick & Burke was dissolved on January 1, the partnership agreement expiring by limitation. Albert B. Herrick and James Burke, who constituted the firm, will continue to devote themselves to the practice of electrical engineering and their address will remain 150 Nassau street, New York.

The offices of the Standard Air Brake Company have been moved from 100 to 168 Broadway, New York. Joseph R. Elliott will succeed Mr. Wessels as managing director. The company is in a very prosperous condition, having in hand many orders from foreign countries as well as from all parts of the United States.

The Union Equipment Company has been incorporated at Trenton, N. J., to manufacture electric appliances and equip railways. The capital stock is \$1,500,000; and the incorporators are Frederick Hitchcock, Glenn R. Gardner and Francis J. Boyer, of New York; F. W. Hunter, Cranford, N. J.; Frank G. Gourley, Stamford, Conn.

The Chase Construction Company, Majestic building, Detroit, Mich., is about to begin work on 30 miles of electric road between Indianapolis and Greenwood, Ind., under a contract amounting to \$160,000. The company has the overhead construction of the Dayton & Western Traction Company well under way. An order for 360,000 lbs. of copper wire was recently placed by the Chase Company with the Western Electric Company, of Chicago.

The advance sheets of the United States consular reports which are issued daily, except Sundays and legal holidays, by the Bureau of Foreign Commerce of the Department of State cannot fail to prove of great value to American jobbers doing a foreign business, as accurate information as to matters of trade is thus early placed at their disposal.

A firm which has a strictly first class article in which quality is always maintained, and is content to sell it at a fair price, has all the monopoly it desires without resort to trusts and combines. Such a one is "Smith of New York," whose business the past year in all kinds of headlights and car lamps shows a big gain over the previous 12 months.

The Westinghouse Electric & Manufacturing Company has received the contract to supply engines, dynamos and cars for the new municipal lines of Glasgow, Scotland. Another foreign order recently awarded the Westinghouse Company is for engines and dynamos for street lighting in Malaga, Spain, a city which, hitherto, has used English machinery.

The Ohio Brass Company states that the volume of business done in 1897 exceeded that of any previous year, and that the shipments for the latter part were twice as great as for the corresponding period the year before. Arrangements have been made for handling a larger business during this coming year than for any other year in the history of the company.

The American Electrical Works, Providence, R. I., which during the year ingeniously keep before the trade the merits of their bare and insulated electric wire, make it a point to send their friends each Christmas, something novel. This year it was a Christmas tree laden with presents, all properly labeled, which did not fail to entertain and no doubt in many instances furnished ideas for what to get.

The Williams & Moore Manufacturing Company, of Chicago, which recently made an assignment, has sold all its interests to the Q & C Company, of Chicago. The two specialties of this company, the Williams & Moore railway jack, which is well known to the trade, and the Williams track drill, more recently brought out, will hereafter be manufactured and sold by the Q & C Company.

The Western Electric Company is the agent for an automatic time switch, recently perfected, for turning on and off electric lights. It is a double pole switch arranged in combination with a clock, the clock being set as an alarm clock would be, for turning on or off the lights. If a contract calls for lights to be turned off at a certain time the switch may be enclosed in a locked box and set each day by an inspector of the company.

A. O. Schoonmaker, 158 Williams street, New York, has lately received a number of letters from street railways highly recommending his solid sheet mica segments. The Atlanta Consolidated Street Railway Company writes: "In regard to your mica, we can say that we have been using this mica for five or six years and have no complaint whatever to make. It gives us satisfaction wherever used. Our orders have always been taken care of and filled promptly and correctly."

The Pennsylvania Car Wheel Company has been organized recently and will soon erect a plant in Pittsburg for manufacturing high grade car wheels. The company has a capital stock of \$100,000, and it has the backing of men experienced in the business. It is believed that Pittsburg is a favorable situation for producing the best grade of wheels at least cost, and will be a good distributing point. C. V. Slocum, formerly of the New York Car Wheel Works, will be the superintendent.

J. M. Denniston has resigned his position with the St. Louis Car Company to accept a much better one with the E. T. Burrowes Company, of Portland, Me. Mr. Denniston becomes general sales agent for the United States, and will for the present make his office headquarters at 1116 Chamber of Commerce building, Chicago. His 12 years' experience and his very wide acquaintance among and universal popularity with street railway men, render his new connection one in which his many friends will feel congratulations are equally due to Mr. Denniston and the company he is to represent after January 1.

The Siberian Railway of Russia and clear down to the Valadastock, Siberia, is being equipped with shops for repairing cars. The outfits of machinery for these shops were bought from the Egan Company of Cincinnati, Ohio, U. S. A. The plants are not large, but there are many of them, and any one of them, in a limited way, builds cars complete as well as repairs them. Prince Hillkoff, on his recent trip around the world, stopped off at Cincinnati, especially to visit the plants of the Egan Company, and he was much impressed with his inspection of this great wood working industry, and found it more complete and better fitted up to turn out machinery than any he had found in America or elsewhere.

While the large station units now installed are direct connected, there remain hundreds of the smaller roads which will continue for a long time to be belt driven, and these in the aggregate represent probably several times the power of the large stations. Though less is said and heard about belts, than formerly, the question of belting is an important one. The Shultz Belting Company, St. Louis, which has built up what is undoubtedly the largest business in street railway belts of any concern in the country, has done so on the high quality of its product, which when once used becomes standard. The Shultz home trade shows a large increase, as does also its foreign shipments, which have been exceptionally large during the past year. It has agencies in all parts of the world.

It is predicted that the Falk Manufacturing Company will make more cast-welded rail joints this year than have been made altogether previously, and this only from the present indications of business. About 2,000 of the 8,000 joints, for the Capital Traction Company, of Washington, D. C., are finished and work is progressing rapidly. Several thousand joints will be made for the 3rd avenue line, Brooklyn, as soon as the weather permits, as will also the finishing of the work on the Union Depot line, at St. Louis, where about 2,000 joints have been made and about 6,000 more are being welded. This winter has been a trying one for rail joints, owing to the great variations in temperature, but the reports, so far, of the Falk cast-welded joint, show

less breakage even than formerly, so there can be no excuse of "waiting to see," hereafter, as the Falk cast-welded joint has been demonstrated to be a practical joint to withstand the summer's heat and the winter's cold.

We received a neat and artistic booklet entitled "Sense and Nonsense in Street Car Heating," from which we quote:

"When the sportive icy Manitoba blizzard,  
Comes a snowin' and a blowin' down the street,  
Rolling shivers through your marrow and your gizzard,  
Nipping ears and nose, your fingers and your feet,  
Your instinctive thoughts revert in short-hand meter  
To the trolley car approaching up the street,  
For you know beside the New Columbia Heater,  
You will find there's warmth and comfort on the seat."

There is perhaps more sense than nonsense in the booklet, but they fit well and read well together. It is nicely illustrated and is well worth reading and will be sent on application by the McGuire Manufacturing Company, of Chicago.

The McGuire Manufacturing Company reports a most satisfactory condition of trade at the close of the year. It has practically completed delivery of the Alley "L" trucks and commenced work on heavy orders from the Consolidated Traction Company, of Pittsburgh. It also has large contracts on hand which will require several months to fill. Trade on the "New Columbia" heaters has been most satisfactory for the year, and the sale of the "Combined Snow Plow and Sweeper" has been surprisingly large with orders yet to fill and still coming. This sweeper is pronounced indispensable by many well regulated street railways. The company expects that the coming year will be the most extensive and prosperous in its history. To meet the prospective demand, it contemplates the erection of additional buildings and the installation of a large amount of machinery.

#### THE STOW FLEXIBLE SHAFT.

The latest catalog of the Stow Manufacturing Company of Binghamton, N. Y., describes and illustrates the adaptability of flexible shafts to many operations where it is desirable to take the tool to the work instead of the work to the tool. A drilling plant for work on street railway tracks has been very successful. It consists of a 500-volt, 1-h. p. motor, flexible shaft, universal joint, track drill press, track old man and an attachment for making electrical connections with the trolley circuit. The whole apparatus is simple and compact and weighs but 20 lbs. It is a great time saver on any work involving drilling holes in the rails outside the repair shop. The Stow apparatus and tools have given unqualified satisfaction, and when once used by a road become one of the indispensable fixtures.

That a hatpin is a very dangerous and effective weapon was demonstrated by a Chicago miss who rendered valiant service to a cable car conductor in fighting two highwaymen. The conductor was receiving a fare from the young lady when his arms were pinned to his side by one robber and the other began to rifle his pockets. The conductor struggled bravely but was being overcome when the young lady pulled a long and pointed pin from her hat and began to prod the legs of the robbers. This proved more than they could stand and they took to flight. Woman like, the girl fainted when the danger was past.

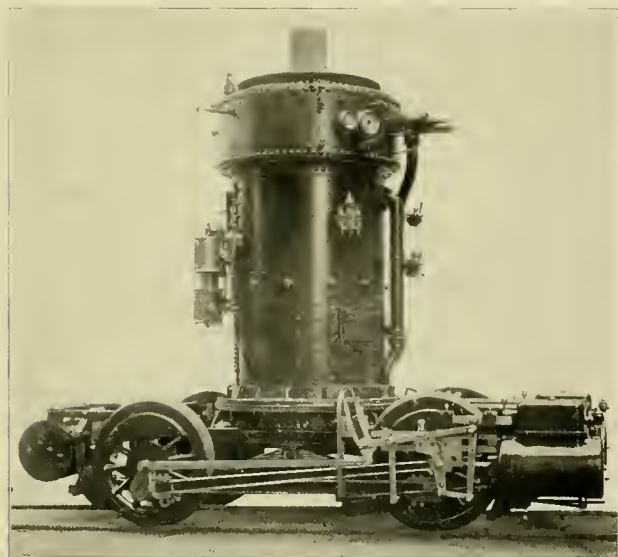


## THE NEW ENGLAND "COMPOSITE" CAR.

In a paper before the New England Railroad Club, C. Peter Clark, general manager of the New England Railroad, discussed what he calls the "composite" car and its field. The "composite" is a combined passenger car and locomotive, which was placed in service on one of the branch lines of the company last summer.

The reason for the experiment with this type of car is that an investigation of the density of the passenger traffic showed 325,000 train-miles per annum, where the number of passengers carried was less than 25; on some lines the average was as low as six. For the sake of economy it was necessary to reduce the cost of the service and yet not affect the frequency of the trains. Recourse was had to the dummy car, and after consultation with Mr. Clark, the Schenectady Locomotive Works designed the "composite."

The car is one formerly used as a dining car, is 64 ft. long and has a seating capacity for 60 passengers. One end of the car is carried on a six-wheel passenger truck and the



MOTOR TRUCK OF COMPOSITE CAR.

other on the motor truck shown. For this illustration we are indebted to the Railway Age.

The locomotive has cylinders 12 in. in diameter and 16 in. stroke, drivers 42 in. in diameter, and the boiler carries a working steam pressure of 200 lbs. per sq. in. The Reagan water grate is used and gives satisfaction. There being no room for eccentrics between the wheels, the Walchaert valve motion is employed. The car is equipped with Westinghouse air-brakes.

Probably the most interesting and ingenious feature is the arrangement for carrying the car body upon the power truck. Around the base of the boiler box is fastened a circular casting of iron. In this casting is a groove in which are 125  $1\frac{1}{2}$ -in. steel balls. A similar casting, with the groove upon the lower side, is built into the floor of the car, the intermediate sills of which are of necessity removed in the space needed for the boiler, with the casting upon the car floor resting upon the balls. In this way a circle of ball bearings is formed which enables the power truck to curve freely without appreciable friction, even with the considerable weight of the car body and contents. If there is any

swinging motion to the power truck, a simple roll of the balls relieves the car from all sympathetic motion, there being no suggestion of reciprocating motion communicated to the car body.

The fuel is either coke or anthracite coal. Water is carried in two tanks, 24 in. in diameter and 30 ft. long, carried under the car. They have a capacity of 1,500 gallons. As this water is wholly or partially used during a journey it follows that the springs carrying the car must be comfortable for the passengers, whether the car body weighs 12,000 lbs. more or less. This has been secured by putting helical springs between the tank hangers and the car sills.

The water carried will last for 50 miles on fairly level track, and the coke bin carries fuel for 100 miles. The best speed record so far attained is a mile in 61 seconds.

A New York sensational paper indulges itself in a full page on the fears that electrolysis will wreck the Brooklyn bridge.

The Rogers law, which was passed by the legislature of Ohio two years ago, authorizes the extension of street railway franchises for a period of 50 years beyond the termination of the existing franchises. A bill, repealing this law, has passed the House.

A new schedule was put in operation on the lines of the Scullin system in St. Louis on New Year's day. This will shorten the working days of the motormen and conductors from 12 to 9 hours per day, and will give a 2-minute service during the busy portion of the day.

While a Clark street cable car was passing through the La Salle street tunnel under the Chicago river, Conductor J. Burke fell from his car and was fatally injured. He was changing the gate on the middle trailer, lost his balance and was crushed by the wheels of the following car.

The Manufacturers' Railway Company, of Fair Haven, Conn. which has been operating an electric locomotive for switching purposes, has had a satisfactory business the past year. On an average 400 loaded cars are handled each month, and this was increased to 550 in November.

About 6 a. m. on December 26 a car on the Roxborough, Chestnut Hill & Norristown (Pa.) Railway got beyond control on a long grade, the rails being wet and slippery from mist and hail, and jumped the track. The motorman, the conductor and one passenger sustained painful injuries.

Special cars, to be built after the plans furnished by the postal department, will be put in service on the street railway lines in Detroit, which have contracts with the government to carry mail. The mail cars will have a daily mileage of 290, and about \$10,000 will be paid for this service this coming year.

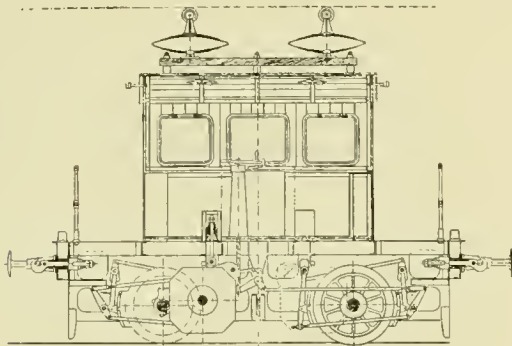
Street railways in Arkansas are exempt from the railroad lien law. In the suit of the Little Rock Traction & Electric Company against R. C. Butler, et al., the act of 1887 making claims for supplies liens upon railroad property was cited. Chancellor T. B. Martin has just handed down a decision holding that the act does not apply to street railways.

## RECENT IMPROVEMENTS AT MEMPHIS.

We are advised by the general manager, F. G. Jones, that during the last year the Memphis Street Railway has done considerable work in the way of increasing and bettering its equipment. Fifteen miles of track have been rebuilt, the light rails being replaced with 80-lb. girders or 75-lb. T's. Sixteen new motor cars and equipments have been added. The power house equipment has been increased by an Allis cross-compound condensing engine direct connected to an 850-k. w. generator. Artesian wells were dug, and the necessary apparatus installed to make the plant a condensing one.

## GERMAN ELECTRIC LOCOMOTIVE.

The Allgemeine Elektrizitaets-Gesellsch..ft. of Berlin, has designed an electric locomotive suited to the conditions of service on the Prussian state railroads. The locomotive weighs 20 tons and has a capacity of drawing a train weighing 120 tons at the rate of 31 miles per hour. It is standard gage, 4 ft. 8½ in., and the wheel base is 8 ft. 2½ in. The wheels are 3 ft. 3½ in. in diameter. Provision has been made for using air brakes if desired. There are two series-wound



GERMAN ELECTRIC LOCOMOTIVE.

motors, each with a maximum capacity of 150 h. p. The gears are single reduction with a ratio of 1 to 3. As may be seen in the cut two bronze rollers are used in place of trolley wheels to permit continual reversal in the direction of motion. Two wires are strung in parallel about 6 in. apart. It is intended to have the rails bonded for a return circuit. Ballast boxes are provided for sand or iron to give additional weight to the locomotive. It would be of interest to compare the details of this locomotive with those of American manufacture which have preceded it.

## WHARTON & CO., CARNEGIE AGENTS.

William Wharton, Jr. & Co., engineers, founders and railroad contractors, Philadelphia, announce to the trade that the Carnegie Steel Company, Limited, has appointed them its general agents for the sale of girder and other special rails for street railways. The Carnegie Company is now preparing rolls for a line of up-to-date sections (including guard rails) 9-in., 7-in. and 6-in. in height, with wide base flanges. These rails will be made of the high carbon, low phosphorus steel now demanded by street railways. Wharton & Co. have increased their facilities, and are prepared to furnish all special work promptly. The Carnegie rails will be used and as the guard sections will exactly

splice with the straight track rails, street railways can secure a complete track (including special work) without a compromise joint in it.

## THE BRILL "PERFECT" TRUCK.

"The Record of the Perfect Truck" is the title of a pamphlet just published by the J. G. Brill Company; it is a brief resumé of the conditions of interurban and suburban service, the advantages of the "perfect" or No. 27 truck for such service, and what the roads using these trucks have to say of them. The truck has already been described in the "Review" and our readers are familiar with it. It will be noted that the letters from the users of the "perfect" truck are so strong that the manufacturer need not go beyond them for the most glowing description. They are as follows:

A. B. Greenburg, president of the Atlantic Highlands, Red Bank & Long Branch Electric Railway: "Knowing that you will be interested in the performance of your No. 27 trucks, furnished with the large cars which we purchased from you several months ago—considering the unusually severe conditions under which they are operated on our Belford division, we are pleased to inform you that they have given perfect satisfaction. On account of the bad condition of the track on this division, we found it practicable to operate only eight-wheeled cars, having your No. 27 trucks. The riding qualities of the trucks are such that between Red Bank and Belford the speed is frequently at the rate of 28 miles per hour, and occasionally a speed of 30 miles per hour is attained."

Herbert A. Clarke, general manager of the Long Island Electric Railway Company: "I have for the past couple of months been connected with the Long Island Electric Railway Company, where there are 10 double truck cars mounted on your No. 27 pivotal trucks. I am pleased to say that in my opinion the riding qualities of the No. 27 trucks are unequalled in any other pattern of truck."

Will Christy, general manager of the Akron, Bedford & Cleveland: "We think it has many points of advantage. The braking apparatus is especially good; it rides easily, and with our speed does not leave the track, although the treads of our wheels have to be narrow, owing to high pavements in the cities."

Charles W. Wason, president of the Cleveland, Painesville & Eastern: "Regarding your No. 27 truck, which you have named 'the perfect passenger truck,' I desire to say that we were quite a while deciding as to which would be the best suited to the requirements of our road. After having investigated most all of the different patterns of pivotal trucks, we went to Buffalo and took a ride on a car equipped with your 'perfect passenger trucks.' The difference in riding qualities was so marked that we decided then to adopt yours as a standard. I am pleased to say that our experience has proved our judgment to be correct, as the No. 27 truck is the easiest riding truck that we have ever had experience with."

B. Mahler, president of the Lorain & Cleveland: "I am pleased to say that on many of the roads in which I am interested we have tried not only your truck, but the trucks of other makers, and have settled upon your No. 27 as our standard. All of the cars of the Lorain & Cleveland Rail-



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OF EVERY DESCRIPTION.***We carry a Large and Complete Stock of Everything needed for the Construction,  
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way Company are equipped with your No. 27 truck, and I am free to say that their operation, thus far, has been very satisfactory."

Burt Van Horn, general manager of the Buffalo & Niagara Falls road: "We are pleased to say that it was on our road that the first test was made of the No. 27 trucks under one of our cars. The difference in the riding qualities was marvelous, and it is not an exaggeration when we say that the people along the line of the road actually waited for the one car mounted on No. 27 trucks. The result was so satisfactory to us that since that time we have changed our entire equipment and are operating only your No. 27 trucks. They have given us the best of service and are the easiest riding trucks that we know of."

Lewis S. Wright, general manager of the Schuylkill Electric Railway Company: "Regarding your No. 27 trucks it gives the writer pleasure to advise you that during the short time we have had these trucks we find that they come fully up to your recommendations. In purchasing these it was with some little hesitance in the face of the fact that we had in service other trucks giving fairly good satisfaction, and which cost less money. However, it is now showing clearly that we have made no mistake, as they ride much more smoothly and quietly than the other trucks."

F. G. Jones, vice-president and general manager of the Citizens' Railway Company, Memphis: "We have had several in operation for nearly a year now, and up to the present time they have given the very best satisfaction and service, and from present indications we can see no reason

why they will not always continue to do so. They are exceedingly easy riding, and hold the rails with wonderful tenacity. On some of our divisions they are operated at a speed of 30 miles an hour, and we have never had one derailed under any conditions."

E. S. Breed, general manager of the Central Railway & Electric Company, New Britain, Conn.: "The No. 27 trucks, which we have in operation, are giving the very best of satisfaction. They run easy and ride smoothly; in fact, more so than any other pivotal truck that I have yet seen on any electric road. They possess advantages in construction, having a wider spring base than any other pivotal truck, and, in addition, have the spring swinging links, which keep the bolsters from coming in contact with the wheel piece when striking a curve at a high speed."

**TOO LOW A FARE IN BROOKLYN.**

It may be remembered that in January, 1897, the Brooklyn Elevated Railroad Company sued the Nassau Electric Railroad Company and the Brooklyn, Bath & West End Railroad Company to prevent the carrying of passengers to Coney Island for a 5-cent fare over the tracks of the two latter roads. The plaintiff secured a judgment for \$15,903.20, which, on appeal, was modified and reduced to \$10,653.20. The case has been carried to the Court of Appeals, the defendant companies agreeing to pay damages at the rate of \$10,000 per year up to the date of the final decision, if that shall be against them.

## BELT DRIVEN GENERATOR FOR STREET RAILWAYS.

Although the direct connected generator has been so universally adopted there is still a field for the belt driven dynamo in street railway power stations where small units only are required. The General Electric Company has recently introduced a line of these machines ranging from 110 to 500 k. w capacity in five sizes, the illustration represents the smallest machine. Already 55 of these generators, aggregating over 10,000 k. w. have been sold.

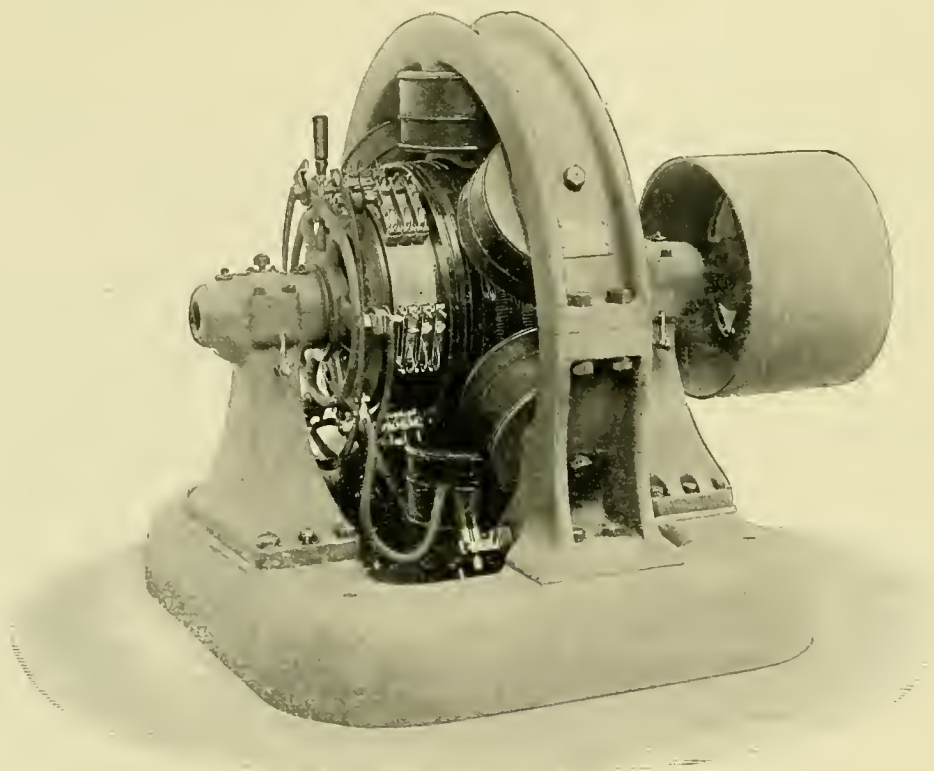
There are six magnet poles, and the frame is of cast steel heavily ribbed, making it light and compact. Its magnetic efficiency is very high. The steel poles and pole pieces are cast in one piece and so bolted to the frame that they may

taken from the coil to the segment directly beneath it. The ventilation of the commutator is effected by air being drawn through the body and discharged through air ducts in the core. The rotary motion of the armature creates a strong draft through the winding and the air ducts provided between the laminae of the core. The small difference of potential between the commutator segments secures permanent insulation and freedom from sparking.

## CHRISTMAS ON THE CAR.

An illustration of the great truth that people are good-natured at Christmas time was observed on an electric car the other day, says the Washington Times

The car was crowded with passengers who had evidently



GENERAL ELECTRIC 110-K. W. BELT DRIVEN RAILWAY GENERATOR.

easily be removed without disturbing either the armature or the frame. The bearings are built on the ball and socket principle, being self-aligning and self-oiling.

The shunt and series windings are placed side by side, instead of one on top of the other, and are entirely independent; either may be removed without disturbing the other. The strength of the magnetic field is so proportioned to the armature reaction that a constant brush lead and neutral point are assured even with heavy overloads.

The armature is of the barrel wound type, this method giving the smallest number of joints, and facilitating repairs, as few coils need to be removed to reach any particular one incapacitated for service. The cast iron flange, bolted to the armature spider at each end of the core, forms a support as well as a cylindrical receptacle for the projecting ends of the coils, and protects the windings from any oil that may be thrown from the bearings. The projecting ends of the coils in the flange are thoroughly insulated, and are held in place by steel bands. The commutator leads are each

been shopping for Christmas. Among them was a poorly but neatly dressed woman, who carried a basket, in which was a hen, the hen being tied by the legs. The car whizzed rapidly up the street; the hen, apparently quiescent, was reflecting on the joys of Christmas from a gallinaceous point of view, and presently worked her feet free of the fastenings, rose out of the basket and flew down the street. The owner of the hen, in great agitation, implored the conductor to stop the car, and as he good-naturedly did so, in the middle of the block, she descended, leaving her basket, her umbrella and her purse in the seat, and started on a lively chase after the hen, with odds on the hen. The conductor did not know what to do. He did not want to go on, taking the poor woman's property away from her, nor did he want to keep two crowded cars full of people waiting while that hen pursued the way to freedom. He compromised by getting off the car and joining in the chase. Four other men followed his example. The rest of the passengers poked their heads out and watched the hunt with interest. The hen was



finally, by the united efforts of six people, caught and firmly held, and the owner returned to the car with her guard of honor, her triumph, and her hen. Then the conductor breathed a sigh of relief, rang the bell, and the car went on. And nobody swore.

**SERVICE STRIPES AT CINCINNATI.**

The Cincinnati Street Railway Company has adopted service stripes for its employes, the resolution of the board of directors authorizing them being passed at the meeting held December 21. The resolution in full is as follows:

Resolved, That each employe of the Cincinnati Street Railway Company is hereby authorized, commencing January 1, 1898, to wear upon the left arm of his uniform coat, a stripe indicating the number of years of service with the company, in the following manner:

For two years of continuous service, a light blue stripe, 1/2 in. wide, pointing up and around the sleeve, the lower end starting at the cuff

For four years of continuous service, a light blue stripe, 1/2 in. wide, with a narrow scarlet strip on each edge, pointing up and around the sleeve, the lower end starting at the cuff seam.

For five years of continuous service, a gold stripe, 3/8 in. wide, laid on a light blue stripe, 1/2 in. wide.

For 10 years of continuous service, a gold stripe laid on a scarlet stripe.

For 15 years of continuous service, a gold stripe laid on an orange stripe.

Resolved, That the Cincinnati Street Railway Company will, at its own expense, furnish each employe entitled thereto, with one of the above decorations for each period of service named in the foregoing resolution.

Resolved, That the term of service shall begin with the date of employment by any of the following named companies, the Cincinnati Street Railway Company being the successor thereof: Cincinnati Street Railroad Company; Passenger Railroad Company; City Passenger Railroad Company; East & West End Street Railroad Company; Route Nine Street Railway Company; Cincinnati Consolidated Street Railroad Company; Storrs & Sedamsville Street Railroad Company; Cincinnati & Clifton Inclined Plane Railroad Company; Cincinnati & Spring Grove Avenue Street Railway Company; Walnut Hills & Cincinnati Street Passenger Railway Company; Mt. Adams & Eden Park Inclined Plane Railway Company; Mt. Auburn Cable Railway Company."

Immediately after this action the division foremen of the road were directed to take a census of the employes, and the latter were given orders for the work of affixing stripes to uniform coats.

**CONTINGENT FEES IN ILLINOIS.**

In 1896 it was decided in the supreme court of Illinois that it was legal for an attorney to undertake the recovery of damages for clients on a commission basis, providing the client advanced the costs. A decision rendered in December, 1897, holds that while such a contract is not champetrous it is void because against public policy; this leaves the attorney at the mercy of his client who may settle and circumvent the collection of the attorney's fees.

The facts were these: A Mrs. Butler sued the North Chicago Street Railroad for \$50,000 and assigned to her attorney, L. M. Ackley, one-half the right of action as his fee, she to advance money for court costs and actual expenses, however. Afterwards, she settled with the company for \$3750, without the knowledge of her attorney; the company having notice of the contract paid her in full. Ackley then sued the company for his fee, one-half the amount. The decision on the point involved is as follows: "The law does not discourage settlement in cases for personal injuries. Whether a cause of action exists, its nature and amount are always involved in uncertainty, and a defendant has the right to buy his peace. The plaintiff has a right to compromise and avoid the anxiety resulting from a cause pending to which he is a party. Any contract whereby a client is prevented from settling or discontinuing his suit is void, as such agreement would foster and encourage litigation."

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### EFFECT OF THE UNION LOOP ON TRAFFIC.

It was confidently predicted that the completion of the Union Loop would have the effect of greatly increasing the traffic on the elevated roads in Chicago, but the results exceed the most sanguine expectations.

The Metropolitan began operations over the loop on October 11. The data as to the number of passengers carried daily since that time are not at hand, but an accurate estimate can be made. During the month of October the total number carried, as shown by the receiver's report, was 1,533,571. During September the total was 1,144,120, or 38,137 per day. Deducting 10 times this for the traffic during the first 10 days of October when the trains did not use the loop, leaves for the remaining 21 days a total of 1,152,798, or 54,866 per day. This is an increase of nearly 44 per cent. For the month of November the total number of passengers was 1,923,684, or 64,103 per day. This is an increase of 68.1 per cent over the September and 16.8 per cent over October traffic. The report giving the traffic for December has not as yet been filed. The equipment of the company has been severely taxed to take care of the business, and the receiver has obtained permission from the court to buy the needed rolling stock. Orders have been placed for 56 motor trucks and 26 cars, both being of the same type as now in use. At the present writing the particular type of motor to be used has not been definitely decided upon.

The South Side Elevated started around the loop just one week later, October 18. The average number of passengers daily from October 1 to 17, inclusive, was 32,327, and for the other 14 days 47,946, an increase of 48.3 per cent. The heaviest increase is during the shopping hours; for the different times of the day the figures are as follows: Midnight to 5 a. m., 30 per cent; 5 to 9 a. m., 46 per cent; 9 a. m. to 3 p. m., 53 per cent; 3 p. m. to 7 p. m., 49 per cent; 7 p. m. to midnight, 41 per cent. During November the daily average was 54,295, which is an increase of 66.7 per cent over that for the first part of October, and 13.2 per cent for the latter part of October. During December the daily average was 56,774, an increase of 4.6 per cent over November.

The Lake Street road has enjoyed the advantages of part of the Loop since October, 1896, when its trains began running down Wabash avenue to Adams street. The completion of the Loop has increased the traffic on this road, but official figures are not at hand.

### THE BOSTON LEASE.

Immediately after the rejection of the first lease negotiated between the West End Street Railway and the Boston Elevated Railway Companies a second proposition was formulated and at once ratified by the stockholders of the two companies. This was approved by the Railroad Commissioners in a special report issued December 15, in which they say:

"The lease now proposed contains important changes in several particulars to which attention was called in the special report on the first petition:

"1. The stipulated dividend rental on the West End common stock is reduced from 8 to 7 per cent per annum.

"2. The term of the lease is shortened from 99 years, to 24 years, 8 months and 9 days, from October 1, 1897, so that the lease shall expire at the same time with the special immunities which are granted to the Boston Elevated Railway Company by statute.

"3. There is inserted in the amended lease a covenant that the lessee 'shall not diminish the facilities for travel upon the lessor's railway, except so far as substantially equal facilities may be furnished in substitution therefor, either by the lessee's elevated railway or otherwise.'

"4. The mandatory provision in the former lease, that 'the lessor shall make and execute such other leases or operating contracts with other street railway companies as the lessee may request,' is stricken out."

The new lease provides that the West End transfers all its property to the Elevated, the latter to pay all operating expenses, repairs, taxes, fixed charges and damage claims, to assume all the contract obligations (except \$10,945,000 of bonds), and to pay the legal expenses and cost of maintaining the organization of the West End, and provide offices, etc., for the transaction of its business. Dividends of 8 per cent on the preferred and 7 per cent on the common stock are guaranteed to the West End stockholders.

The West End road is required to pay for certain improvements to the property, as follows: 1. Abolition of grade crossings. 2. Additional rolling stock and equipment. 3. Additional track mileage and equipment. 4. Additional real estate. 5. Additional stations, power houses, car barns, etc., and equipment. 6. Additional bridges, buildings, etc. 7. In renewals the excess of the cost of the renewal over the cost of the thing renewed.

A board of arbitration is provided to pass upon disputes arising between the parties.

### CHANGING INSULATORS ON A TEN-THOUSAND-VOLT CIRCUIT.

It has been a dangerous operation to replace a bad insulator on a high voltage transmission line without shutting off

the current. Wm. B. Jackson, of Detroit, describes in a letter to J. G. White & Co., his method of solving this problem. As shown in the figure a 30-ft. ladder, adjustable in length, is placed on an insulated platform, 30 in. square. At the upper end is a cross board having a hole in it to fit on the end of the cross bar. The lineman then screws on the cross arm a small hand vise which is of iron with a piece of copper wire soldered to it. This wire is touched to the line wire,

upon which the broken insulator is located, with a 3-ft. stick which has been boiled in paraffine. If everything is all right the wire is wrapped around the line wire. When the grounding wire is on, the lineman changes the insulator with bare hands, and then the grounding wire is disconnected and the clamp removed. It is stated that when the apparatus is dry this operation is quite safe.







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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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A pessimistic writer in one of our English exchanges, commenting on fenders as used in this country on trolley cars, indulges in the belief "that the fender takes very much after its prototype the cow-catcher, which preserves the train from injury, but not the cow."

On another page is an account of a professional contortionist who sought to eke out his earnings by falling on railroad platforms and dislocating his hip, collecting substantial damages therefor. Being able to do this without serious pain or inconvenience to himself, the scheme offered many advantages. The ingenuity of these people who believe that the world owes them a living, and who generally try to collect it from transportation companies, is astonishing.

President Ripley of the Atchison, Topcka & Santa Fe Railroad has recently written two open letters in reply to attacks made upon railroads in general, and upon his road and his management of it in particular, by John Davis, who formerly represented a Kansas district in Congress. A brief abstract of the reasons why Mr. Ripley does not agree with Mr. Davis as to the desirability of the government ownership and operation of railroads appears on another page and will be found quite interesting. While similar legal questions might arise were a municipality to attempt to acquire the street railways within its borders, and questions of juris-

diction with regard to the operation of suburban and inter-urban lines, the political control of a business that requires the best of management, and the fact that former experiments show that the public is not a successful competitor with private companies in enterprises of this nature, are the points deserving consideration.

Furious storms of snow and sleet driven by high winds visited the central states on January 22 and 23 and again a week later, and the Atlantic coast states on January 31. The snow was damp and was packed by the force of the winds, rendering it in many cities impossible to remove with plows and sweepers. Notwithstanding the magnitude of the difficulties, the promptness with which the roads in all parts of the country opened their lines and resumed service was highly creditable to managers and employes.

And now the motorwoman. For years the street cars in many of the South American cities have had none but young women for conductors, and the plan has given satisfaction to the company and the public. It has remained to a New York state road to graduate the first full-fledged and duly credentialed motorwoman. From all accounts there seems no question but that the candidate for the head end of the car in this case has demonstrated her ability, both physically and mentally, to perform the duties of that position with safety and satisfaction.

The New York dailies, which have repeatedly had the underground road, known as the "Rapid Transit," all built on paper, now come out with the announcement that the scheme is dead. It is hard to understand how it can be so dead when it was never much alive, although the "Review" has held several post-mortems on the corpse during the past few years. In our opinion the solution of the problem will be the rebuilding of the present elevated roads to a double-decked structure, with two express tracks, and all four operated electrically.

When private corporations combine or consolidate their interests and operations, they uniformly decrease the expenses of operation. When cities consolidate, the reverse is the result. In the expense budget of Greater New York, which is found to be 25 million dollars in excess of the expenses of the individual municipalities prior to consolidation, we have a convincing proof, although none is needed, of the fact that cities cannot do business as economically as private corporations. When our great cities have demonstrated their ability to properly conduct the various business operations they already have in hand, it will be ample time to consider the increase of their powers by further municipal ownership and operation, and not until then.

"No seat, no fare," is a text upon which has been hung a great deal of abuse of street railway companies. The experience of all roads is that it is impossible to furnish seats to all who wish to ride at certain hours of the day, for the reason that the passengers insist upon taking the first car in or on which they can possibly find places, and will not wait for one that offers more room. Many of the personal injury claims arise because of over-crowding on the part of the passengers in spite of all that the company's employes can

do to prevent it, and in the past year we have published accounts of several such. Were the American public endowed with the patience of some other peoples the difficulty might very easily be arranged.

And now Mr. Pingree, of potato fame, has launched out in a tirade against street railway mail service, and emphasizes his ignorance of the progress of the age by claiming a carrier on foot makes quicker time; says none but the companies want it or can see any good in it. What Pingree says is usually undeserving of notice. The Postmaster-General has highly endorsed the service; so have the postmasters in the cities where it is in operation; so have the business men and citizens. Since the street car postal service has been introduced in Chicago it is possible, and a daily occurrence, to send a letter from one part of the city to another and get an answer the same day, which before was never accomplished in less than 36 hours, without the use of a special delivery stamp.

As a matter of fact, all but Pingree, and some of the companies which are hauling the postal cars at a loss, recognize in it one of the greatest of recent improvements in the urban postal system.

A western road some time ago secured an extension of its franchise for 50 years. The grant was secured in a perfectly open and above-board manner, and it was understood the extension made possible the floating of a large block of bonds, the proceeds of which were to be used in improving and extending the city lines—something the public heartily approved of. The president took his bonds and crossed the water to deliver them to purchasers who had agreed to take them only on the basis of a 50-year franchise, as the city is yet a comparatively small one, and it could not be expected the new investment would yield much return for the first few years. Before he could reach his destination some narrow-minded, short-sighted "reformers" entered suit to annul the extension of the franchise, the news of which traveling on the wires preceded the official to his destination. The result was a failure to deliver the securities, and he returned empty-handed. The people in that town are likely to be somewhat older and, it is hoped, wiser, by the time they get the much-needed improvements.

At the present time the most important problem confronting the owners and managers of interurban roads is that of insuring safety in operation. The number of collisions on such roads has increased with alarming rapidity, and during the past year some of the accidents have resulted in the loss of life. The correspondence which we have had with the managers of a number of these lines, portions of which are to be found in our issue of last month and in the present one, show that all have given the matter their earnest attention. There is agreement as to the best method of insuring safety, that is, to double-track the road throughout; but only in very exceptional instances is the traffic of sufficient magnitude to justify the expense. The double track being an impossibility for most of the roads, they have adopted signal systems whereby the line is divided into blocks, or else attempt to insure that only one car shall be on any section of the line by running according to a carefully prepared time table, with strong rules against leaving meeting points ahead of time or before the location of the car which it is

expected to pass is known. In the majority of cases a telephone dispatching system is found desirable, if not absolutely necessary, in order that cars may communicate with each other and with the office in event of delays. Some companies, while appreciating the advantages of proper signals, are deterred from installing them because the utmost economy is necessary to keep the road going at all; we think it safe to say that in all instances saving on safety appliances is false economy, for a single accident with its attendant damage suits will, as a rule, cost the road more than a good signal system.

The overhead trolley has been accepted in Great Britain; the fact is evidenced by the table of the electric tramways of the United Kingdom published in another column. Save where special conditions permit the third rail, all the electric roads in operation use the overhead trolley, except one storage battery road and one conduit road, which latter is even now being changed to an overhead trolley line. Further, all the roads now under construction will use the overhead wires. We have heard the opinion advanced by those familiar with the conditions abroad, that the application of electricity to street railway operation in Great Britain would be very slow because of the deep-seated objections to the overhead wires in the streets, although it was acknowledged that the overhead system offered the greatest advantages. The amount of the work under construction, over twice the mileage that is in operation, shows how rapid an increase may be confidently expected, now that the prejudice against the system has begun to disappear.

The long and bitter struggle in England between the employers and the Amalgamated Society of Engineers, as the organization of machinists is called, which began on July 12, 1897, is now at an end, and apparently the victory of the employers is complete. The dispute nominally had its origin in a demand by the men for a 48-hour week, which was promptly followed by posting lock-out notices by the employers, who thus met the threatened strikes more than half way. In fact, it was a fight for freedom from unwarranted interference with the management of their business by the trades unions, which by the "one man to one machine" rule, by restricting the output of the men, and thus establishing the principle of "a minimum of work for a maximum of pay," had brought the manufactures of Great Britain to a deplorable condition.

On January 21 the beginning of the end came in the shape of a notice that the demand for a 48-hour week was withdrawn. Thus the employers have won the nominal issue, and, since the strikers yielded only because they could fight no longer, the victors are in a position to win on the real issues as well. It is to be hoped that the employers will remember the dire results which in the past have followed concessions to the tyranny of trades unionism and will not permit sympathy for a fallen foe to lead to similar concessions now, which can only result in a renewal of the fight at some future time.

It is estimated that the strike, which has affected directly or indirectly over 200,000 persons, has caused a loss to the nation of \$75,000,000, as estimated by the English Labor Department. Of this, \$15,000,000 is represented by direct loss in wages and in money paid out by trades unions in supporting the strike.



## THE GOVERNMENT GOES INTO THE ADVERTISING BUSINESS

The industrial press of the country is with one voice protesting against the placing of advertisements in the public documents issued by the Department of State for the Bureau of American Republics. This monthly bulletin, issued in the joint industrial interests of this country and the South American republics, is in itself a praiseworthy enterprise, and undoubtedly capable of much good. When the annual appropriation of \$36,000 fell short of the bureau expenses, then it was the late J. P. Smith came to the bureau with a scheme to pull it out of the hole, and incidentally to pay himself the \$6,000 a year salary. His proposition was a comparatively easy one to work, for he proceeded to open an office in New York, from which vantage ground he solicited advertising from possible exporters of all kinds of merchandise, the said advertising to be inserted in the official publication of the Department. We do not deny that the medium may not be a desirable and valuable one to advertisers—so would an advertisement on all other of the Government documents be good advertising; but we do most emphatically protest against the injustice to every publisher in the land, of printing this monthly paper free on the Governmental presses, transmitting free in the domestic and foreign mails, and using the Government frank under which to send circulars and correspondence both ways, in soliciting these advertisements.

Is it any wonder that with the hundreds of tons of seeds, public documents, furniture, and now this advertising medium, with which the postal service is burdened, that there should be a big deficit annually?

It is a well known question of ethics among publishers, that high class publications absolutely refuse to accept and print certain advertisements. Such advertisers would be only too glad to avail themselves of the endorsement which the printing of their announcement in such papers would give. Hence an advertisement in a public document, bearing the imprint of the Government printing office, must inevitably carry with it a certain stamp of approval of the Government. What publisher in what land can hope to compete with the endorsement of his Government?

Why not carry the argument out to its ultimate possibilities? Fill the Congressional Record with announcements of pills, plasters and face powders (we cannot deny it would sometimes be an improvement on the matter generally appearing there), cover our postoffices, custom houses and mints with big many-colored signs proclaiming the merits of various cure-alls; put a border on the silver certificates in which the holder may learn where to get false teeth for three dollars a set, and testimonials of delighted sufferers from corns. Let our brass cannon carry a banner, "I was polished with Pasolio," and so on to the weary end. There is probably as much money spent in advertising each year as it ought to cost to run the Government in times of peace; why not let the country pay its expenses in this way and do away with taxes altogether?

We do maintain it is contrary to the spirit of our free institutions for United States Government to use its various departments, maintained at the general expense, to enter into competition with the investment of private capital in kindred enterprises. Were this an insufficient argument, we consider it beneath the dignity of the Government to go

into the publication business, charging for its publications and advertisements therein.

It opens the door to the admission of very grave evils.

## PRESIDENT HIGGINS ON THE STREET RAILWAY INDUSTRY.

At the sixth annual convention of the Northwestern Electrical Association, President H. C. Higgins, who is president and general manager of the Marinette (Wis.) Gas, Electric Light & Street Railway Company, in his opening address spoke of street railways as follows:

The street railway business has, I think, suffered more within the past two years than any other legitimate business. Not only has the hard times worked against them, but the bicycles have taken a large percentage of their business. It is gratifying, however, to street car men to know that the expenses of operating as well as those of original purchase have been very much reduced. The reduced receipts have had much to do with the reduction in operating expenses, so that perhaps after all the reduced receipts have been a blessing in disguise, although the reduced receipts have not been the whole cause of our reducing expenses, for when we first went into the electric street railway business it was all an experiment from start to finish. Everything was new to everybody, and we who have had the putting of these appliances into actual operation and have had to furnish the capital to test and bring to successful operation the different electric street railway appliances which are now running so successfully, have, I think, had as hard a task on our hands as the gifted geniuses who invented and put together the many appliances which were sold to us as the best in the market, and sold to us, as you know, at enormous prices, and even at these prices we found them defective in many ways, and we had to improve them as best we could and do the best we could with them.

We all went into the electric street railway business with the greatest hopes of financial success. It was a very attractive business. The man who was running a horse car or a mule car line would go to a town where they were running the new electric street railway; he would see the beautiful cars, with every seat occupied by a passenger, gliding over the track without any apparent effort and at a more rapid rate than he had ever hoped to accomplish on his line, a uniformed conductor on one end, a uniformed motor-man on the other, with everything bright and shiny—a beautiful sight to him—and frequently he did not go home until he first visited the office of John I. Beggs or B. E. Sunny, whose bright, smiling countenance was only a continuation of the bright things he had seen in the electrical equipment at the last town at which he had visited, and got prices from each of these gentlemen for electrically equipping his road at once. He went home, consulted his board of directors the first day, explained what he had seen and some of the things he had felt, and that night sent a night message accepting the proposition of one of the two contestants before mentioned. We all thought in those days that about all that was necessary was to secure a favorable franchise and the electrical companies would do the rest, but I know of no writing that so fittingly applies to the case as a verse in one of Moore's poems, which reads:

I saw from the beach where the morning was shining

A bark o'er the waters ride gracefully on;

And I saw from that beach when the eve was declining,

The bark was still there but the waters were gone.

The nickels which we had expected to have supported our enterprise had, like the waters, gone and left our bark, the street railway, stranded.

It is not to be wondered at that after these five or six years of experiments in the business, and with approved appliances, more efficient help, etc., we can reduce the operating expenses. Every appliance in the business has been an improvement on the first, and we have all contributed something towards this result, until the business has now become one of comparative pleasure to that which it was in its early history when we were trying to operate an electric road on a horse car track with inexperienced help, who, notwithstanding their incompetency, were high-priced and indifferent, for if they were not retained by you they were pretty sure of a job at the next town having a similar business. Our rail bonds were continually breaking, our track continually spreading and letting our cars drop to the ground, and no matter how well it was cared for the track was a constant annoyance. Our commuters were niggling and our motors short-circuiting, and on our very busy day these things seemed to combine to do their worst, or rather their best, to make us miserable. Our days were restless and our nights sleepless, but by patience and persistence we have become masters of the situation, and I think if the writer was alive to-day who wrote the sentence, "He who makes two blades of grass grow where but one grew before is a benefactor," he would add, and he who carries two passengers where but one was carried before is also a benefactor.

As I have been through the poor track and poor car business, and as one of the pioneers in the street railroad park business, I feel that it is not egotism to say that I am competent to give some advice to my fellow sufferers in that line. Do not use less than a 60-lb. steel T-rail; use good sound ties not less than 6 in. wide, lay them 2 ft. centers, and still closer is better; bond with not less than No. 0 bonds; use nothing less than No. 0 trolley wire; buy nothing larger than 16 to 20-ft. cars for general use, and you cannot make much of a mistake by buying the latest type of generators and car equipments from any of the leading companies making and selling such appliances. Do not, however, lay any extra line in order to establish a park, unless you can establish it on the edge of a body of water and have a town of not less than 30,000 people to draw from. Do not lay out much money on animals for your park. Do not run vaudeville or other shows unless you are so situated that their transportation will cost you but little. I believe that street railway parks should be well enclosed and no one admitted unless he pays car fare each way, no matter whether he comes by carriage or bicycle. I do not believe that any town of less than 25,000 people will support an electric street railway and give a decent return to its investors; although two towns aggregating a little less than that population and being some distance apart might be good paying properties, yet local conditions would have very much to do with this. I have known of towns of this size and seemingly about the proper distance apart, and without a cent of interest to pay and light taxes, almost no insurance and lying in the heart of a good coal district

where they got their coal for almost the hauling, and although the road appeared to be well managed still it went into the hands of the receiver for sheer lack of patronage and is still in his hands, and the Lord only knows when it will get out of his hands.

And now in my closing remarks in relation to electric street railroading, while congratulating ourselves upon the pleasant side of the business, I would ask how long the restless brain or the genius of the nineteenth century, or even the twentieth century, coming and already on our threshold, will let us alone. How long will it be before they will have something better to offer us for transporting passengers than an electric street railway? We are already threatened with the airship and the horseless carriage. What will be accomplished in this line is mere guesswork. Let us hope, however, that at least we who are in the business today will get a much needed rest from any further experiments.

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#### EXECUTIVE COMMITTEE MEETING OF ILLINOIS ASSOCIATION.

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The executive committee of the Illinois Street Railway Association met at the Leland Hotel, Springfield, on January 25, 1898; President Patterson was in the chair and all the members except Mr. Barker, of Peoria, were present. The meeting was called to consider a communication from Charles L. Bonney, vice-president and counsel of the Chicago General Railway, concerning the legal relations of street railways to municipalities in Illinois, and the draft of a bill to be submitted at the next meeting of the legislature whereby the contracts between the companies and the cities will be made to conform to the contracts already existing between the companies and the state, that is, of 99 years duration.

The secretary was instructed to notify all members that the matter would be discussed at the annual meeting of the Association on May 18, and Mr. Bonney was requested to prepare a paper to be read at that time. Mr. Bonney was appointed attorney for the Association until the next meeting. It was decided to have papers on the following subjects: "The Operation of Street Railways in Small Cities"; "The System of Collecting Fares and Checking Employes"; "The Relations of Street Railways and Municipal Corporations."

President Patterson, W. F. Brennan, of Chicago, and C. K. Minary, of Springfield, were appointed a committee on arrangements for the May meeting.

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The Metropolitan, New York, is defending a suit against it brought by Inez Carusi, in which the damages are laid at \$75,000. Miss Carusi was a harp-player, whose thumb and index finger were so injured in a street car accident as to prevent her following her profession.

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A collision occurred on the Milwaukee, Racine & Kenosha Electric Railway between a special car carrying the directors of the company, who were inspecting the road, and one of the regular cars. The ends of the cars were wrecked and one of the motormen had both legs broken. The heavy fog prevailing at the time is given as the cause of the accident.



## TEST OF THE CHICAGO STORAGE BATTERY ROAD.

The carefully conducted test of the plant of the Chicago Electric Traction Company furnishes the most valuable data at present obtainable regarding the application of the storage battery to street railway service. The vital question of the cost of battery maintenance is still an open one, yet the batteries tested have shown a better record than any of their predecessors. The results of the tests make a good average showing, just about what might be expected from a trolley road operating under the same conditions.

It may be well to preface the test with a sketch of the history of the company and a description of the equipment. The conception of the road was for the purpose of booming real estate in the southwestern portion of the city. The company was chartered early in 1894 with a capital stock of \$2,500,000, and almost from the beginning it has labored under financial difficulties. In 1895 a majority of the bonds were placed with parties interested in the manufacture of storage batteries with the understanding that battery cars should be run. The company owned six franchises covering 36 miles of streets, but nearly all the tributary territory is very sparsely settled. In a short time the company became insolvent, and in January, 1896, G. Herbert Condict was appointed receiver. Under foreclosure proceedings the road was sold at public auction October 12, 1897, to J. S. Bache for \$260,000. E. R. Gilbert was appointed general manager of the company. Some idea of the traffic of the road is given by a statement of the receipts and expenditures in the receiver's report:

	Passengers and Miscellaneous.	Operating Expenses.
January to June.....	\$4,972	\$9,188
June .....	2,482	3,224
July .....	6,045	4,609
August .....	7,045	6,048
September .....	6,347	6,584
October 1 to 12.....	2,254	2,880

The main line extends from the northern terminus at South Park avenue and 63rd street, the intersection with the Alley L, south to Englewood, Washington Heights and Blue Island, and a branch runs from Morgan avenue west through Morgan Park. The line passes several summer resorts and three cemeteries; a large summer traffic results from the former, and for the latter a car, specially designed for funerals, is in operation. On the Morgan Park line a grade of 9.3 per cent is encountered for a distance of 371 ft. on Prospect avenue. This gradient was insurmountable for a car equipped with one 50-h. p. motor geared to one axle only. A counter weight system was installed which is almost a duplicate of the one in Providence, R. I., designed by M. H. Bronsdon and J. P. F. Kuhlman, and described in the "Review," April, 1896. There are 23 miles of track now laid, of which 19 miles are double.

After the decision to use storage batteries was reached B. J. Arnold and J. H. Vail were employed as engineers to plan the entire system. All the designs follow the most approved lines of engineering practice, and no pains were spared to make it a model of its kind. From the boilers to the batteries everything was designed with a view to economy and convenience. Perhaps this is the first time that the storage battery has been given an honest and prolonged trial in this country, and if it is capable of successful operation in street railway service it should be demonstrated in this system.

The track, which was constructed by C. E. Loss & Co.,

is the very best, for this was essential to long life for the battery plates. Johnson 7-in. girder rails, weighing 80 lbs. and resting on tie plates, are joined by 6-bolt fish plates with tie rods at every joint. Oak ties, 8 ft. long, are spaced 2 ft. between centers and rest on 6 in. of gravel ballast. The construction, with the absence of trolley wires and rail bonds, appears as though it were intended for steam traffic.

The power station is worthy of note, for it is certainly different in many respects from any other railway station. It is not necessary to locate the power house at the "center of gravity" of the system to get the most economical current distribution, so a site was selected at 88th street and Vincennes avenue, convenient to the Rock Island railroad, and where land is cheap and transportation for fuel good. A view of the building is shown in Fig. 1. Car tracks run through the loggia, and above this are the offices, locker room, shower baths, toilet rooms and waiting rooms for the employes.

Fig. 2 is from a photograph of one of the engines direct connected to two of the generators, with the switchboard in



FIG. 1.—CAR BARN AND STATION.

the background. Unlike street railway stations in general, the dynamos are not all of the same voltage, for it is necessary to have three circuits of different potential to charge the batteries properly. Four 6-pole, 190-k. w., shunt wound Walker generators, with a variable voltage between 160 and 190, were installed. This is the ultimate dynamo capacity of the station, the fourth machine being held in reserve. The dynamos are direct connected to two 250-h. p. Willans engines, the kind so generally used in the electric power stations of Great Britain. These two engines are at either end of the room, and a third one, of 500-h. p., will be put in the center. To give the most flexible arrangement the Arnold system of power station construction was adopted. A solid shaft with couplings extends from one engine to the other. The armatures of the generators are fixed to quills which are free to rotate about the solid shaft. This makes a very complete and compact engine-generator installation, a 1,000-h. p. plant occupying a floor space only 12 ft. x 56 ft. Each engine has two sets of cylinders, the cranks being opposite to one another. The steam, enter-

ing the high pressure cylinder, from the steam chest, expands through the hollow piston rod into the receiver space below, ready to act on the following piston. An air cushion takes up the momentum of the moving parts and permits a speed of 380 r. p. m. without excessive noise or vibration. The speed is regulated by a throttle valve in the steam pipe controlled by a centrifugal shaft governor.

Just to the rear of the power units is the white marble switchboard, consisting of five panels, one for each generator and the fifth for the motor switches. There are four bus bars, the three lower ones being for the high, medium and low voltages and the top one the common negative bar.

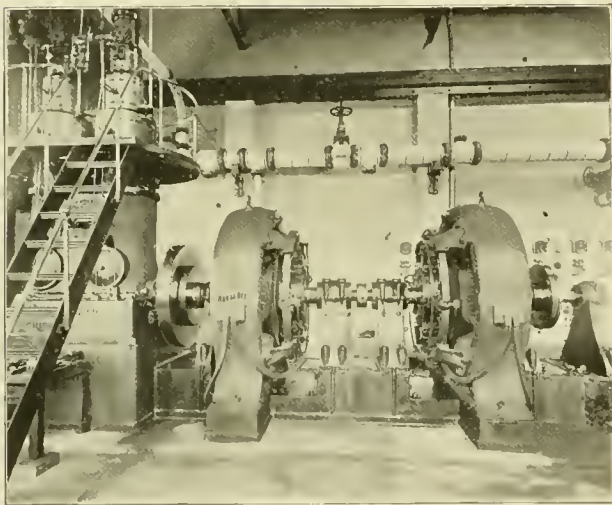


FIG. 2.—ENGINE-GENERATOR UNIT.

Each panel has two switches, one for the negative lead of the generator after it has passed through a recording ammeter and circuit breaker, and the other switch can be turned through a semi-circle making connection with any of the three positive bus bars. Weston illuminated dial ammeter and voltmeter and a resistance box for controlling the voltage are attached to each generator panel. From the motor panel the circuits are controlled which run to the two battery transfer cars, the car transfer tables in the basement, to the cooling tower motor and the other motors in the building. By means of the circular switch in the center of the motor panel the motor bus bars can be connected to any of the three positive bus bars, or the motors can be operated from the car batteries when the generators are not running. The engine room presents a very attractive appearance, being finished with white marble floors and wainscoting, and visitors' gallery.

The passageway to the boiler room is behind the engines and by the condensers in the basement. There are three 200-h. p. Heine water tube boilers, with room for three more. Coal is delivered on a side track back of the boiler room, where it is intended to have the fuel transferred direct from the cars to the iron platform in front of the boilers about 7 ft. above the floor. From here it is shoveled into the hoppers of the Roney stokers.

The smoke stack, which is located about 30 ft. outside the building, is constructed of steel, is self supporting, 7 ft. in diameter and 150 ft. high. It rests on a brick foundation raising it 22 ft. above the ground. Connection to the

boilers is made through an iron flue back and above them and through a brick flue entering the brick base of the stack. A Green fuel economizer, having 192 tubes, is in the brick flue; a by-pass is also provided for service when the economizer is not in use. Adjoining the stack is a Worthington cooling tower, 12 ft. in diameter and 30 ft. high, Fig. 3. The condenser pump delivers the condensed steam and heated injection water to the top of the tower, and here, by means of revolving pipes turned by the pressure of the escaping water, it is sent in sprays over the tops of sewer tile set on end in tiers. During warm weather a large fan, driven by a Siemens-Halske motor, cools the water by evaporation, so that when it collects in the condenser well its temperature is about 80° F. The feed-water pipe taps into the condenser discharge before the pipe reaches the tower.

The supply of feed-water comes from an artesian well and from the city mains, but by the arrangement of the jet condensers and the cooling tower the amount taken is only sufficient to make up for the waste due to evaporation. The water can be taken through a heater which receives the exhaust from the auxiliary pumps and through the economizer into the boiler, or either of the heaters can be cut out if necessary. The economizer not only heats up the water to the boiling point, but also acts as a reservoir with a supply of hot water which increases the duty of the boilers. The steam is supplied to each engine through a 6-in. pipe having a copper expansion bend, and the engine exhaust is conducted to jet condensers.

The most unique and interesting features of the plant are to be found in the battery room, which is in the basement under the car barn. The car battery consists of 72 cells arranged in 12 rows of six each. These cells each have nine plates 7 3/4 in. wide and 14 3/8 in. long, five of which



FIG. 3.—COOLING TOWER AND ECONOMIZER.

are negative of the "Chloride" type and four positive of the "Tudor" or "Manchester" type. The positive plates are 5-16 in. and the negative 1-4 in. thick. Each cell, including plates, electrolyte and hard rubber jar, weighs 100 lbs., making the total weight for a tray 7,800 lbs. The plates are connected by electrically welded lead strips in four groups of 18 cells, each group being joined by flexible



cables to two large brass plates on the sides of the trays. A loose fitting rubber crate over the top of the batteries prevents the electrolyte from splashing out of the jars.

By means of the three separate generator circuits the batteries can be charged at three different potentials as the counter electromotive force in the battery rises. The discharged battery is first connected to the 160-volt main with a current of 150 amperes flowing. The current decreases as the counter electromotive force increases, and when the current diminishes to 30 amperes the battery is switched into the 172-volt circuit. The current jumps to 150 amperes and diminishes again, and then the terminals are transferred

tomary time is a little over a minute. The carriage with battery is shown in Fig. 5. The carriage then carries the discharged battery to an empty charging table, where it is rolled from the elevator and makes electrical connection with the charging circuit. The battery room, although well ventilated, is filled with the fumes of sulphuric acid. This disagreeable condition could probably be obviated by having hoods over the charging batteries and the fumes conveyed to the stack.

The general arrangement and dimensions of the car barn may be seen from Fig. 6. There is provision at present for 28 cars, but it will be extended eventually to accommodate

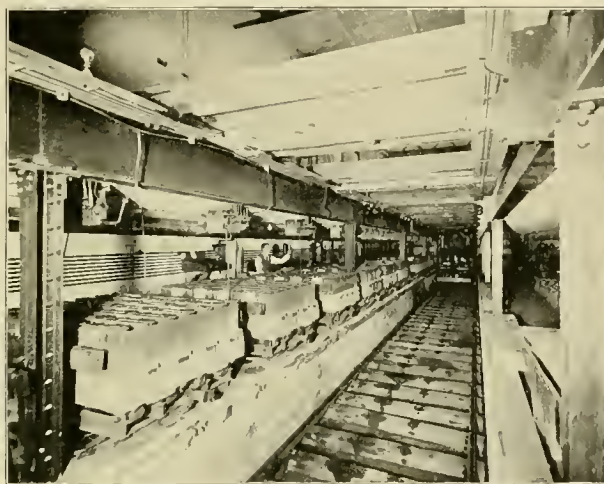


FIG. 4.—BATTERIES ON CHARGING TABLES.

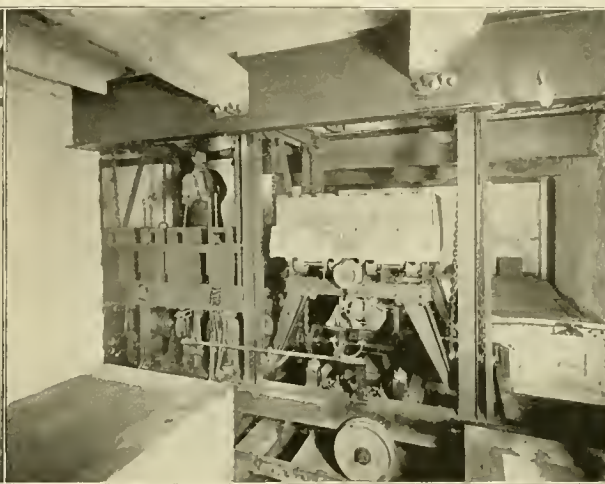


FIG. 5.—CARRIAGE WITH BATTERY.

to the 176-volt circuit. This operation can be accomplished in about 40 minutes, although a slightly better battery efficiency is shown when the time is longer. The battery charging tables are shown in Fig. 4.

After the batteries are charged the next important step is to get them in the cars expeditiously, and this is accomplished by a traveling carriage which runs along the track in the alley alongside the battery tables. On either end of the carriage is an elevator with rolls on top which are operated by bevel gears. Similar rolls are on the charging tables, which can be coupled to the elevator rolls and the trays automatically shifted. In the middle of the carriage is the operator's platform, with a controller for each of the motors, two of which are for the rolls, one for each elevator and one to run the carriage along the track.

When a discharged battery on a car is to be replaced a charged one is rolled upon one of the elevators and the carriage is run to a position where the vacant elevator is directly beneath the track in the loggia. The car, at the end of each round trip, runs into the correct position, which is determined by the vertical position of a lever the conductor lifts so that the front bumper of the car just touches it. The vacant elevator of the carriage is raised and the discharged battery released from the car by pulling a lever. When it is lowered the carriage is advanced so that the charged battery is beneath the car truck. The battery is elevated, the hooks automatically engaging the cross bars and the brass plates on the sides of the trays making a sliding electrical connection with the spring clips on the car trucks which are the terminals of the controller cables. The entire operation can be performed in 50 seconds, although the cus-

50 cars. The transfer table, operated by an electric motor, runs on a track down the center of the barn. No special tools or preparations have been made for repairs. Besides the regular equipment of cars a 3,500-gal. sprinkler is provided for summer and a snow plow for winter.

The motor cars are mounted on Dupont trucks, made by the Johnson Company. Each truck has two bars running across the frame and engaging hooks formed by bending over four 5-in. channel irons, which pass under the tray. A 50-h. p. Walker motor is suspended on the outside of the car axle. The controllers, made by the Walker Company,

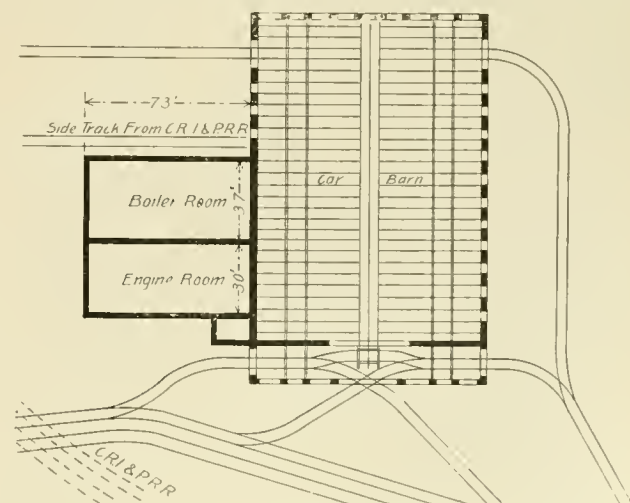


FIG. 6.—PLAN OF BUILDING.

had to be of special design for the service, as the low voltage necessitated large currents. There are five points: the first combines four sets of batteries in parallel, giving 36 volts; the second gives 72 volts with the cells in series-parallel; the third puts the batteries in series with resistance; the fourth cuts out the resistance but leaves the batteries in series, and the fifth shunts the motor field with the batteries in series.

During the summer of 1897 over 20 motor cars were operated, often with trailers, and when the winter schedule of nine cars was instituted Mr. Condict, then general manager of the road, decided to make a complete test of the road and power house to determine the most economical methods of operation. Under the direction of George A. Damon, who was assisted by Professor Gaylord and a corps of students from the Armour Institute, three complete tests were conducted under actual operating conditions. The following is an abstract of the report of the tests for which we are under obligations to Mr. Condict. We are also indebted to Mr. Damon for courtesies extended.

### TEST OF POWER PLANT.

The equipment of the power house has already been described. In preparing for the tests all proper precautions were taken to secure accurate data. The apparatus used was carefully calibrated. The water was measured by means of three tanks just before it entered the feed pumps. The steam used by the stoker engine, by the economizer engine, by the calorimeters, by the feed pump and by the air pump was condensed and carefully measured. The blow-off from the boilers and other unused piping was opened up to guard against the water escaping through unknown leaks. All water not accounted for by the auxiliaries was charged against the engines, with the exception of a liberal allowance for leakage in the live-steam line.

The first test was with the plant running with two boilers, two engines and three generators. The second test was with practically the same load carried by one boiler, one engine and two generators, while the last test was made under practically the same conditions as the second test, with the exception that the three-voltage method of charging the batteries was abandoned. In this test but one generator was used and the batteries were charged in successive sets, all at a common potential, the voltage being raised as the batteries became charged in such a way that the load upon the generator was kept nearly constant.

The coal used was from Fairmount, W. Va., and cost, delivered at the power house, \$1.90 per ton. An average of five determinations of its calorific value by the Berthier method gave 10,145 British thermal units per pound. The average of six analyses gives the following result:

Moisture . . . . .	6.326 per cent.
Volatiles and combustibles . . . . .	32.903 "
Fixed carbon . . . . .	48.126 "
Sulphur . . . . .	2.700 "
Ash . . . . .	10.030 "

*Card No. 7—Taken 3:15 p. m. on November 26, 1897.*

	M. E. P.	Horse Power.
High-pressure cylinder, North Line . . . . .	59.85	31.14
do. South Line . . . . .	71.7	37.16
Intermediate receiver, North Line . . . . .	15.6	6.96
do. South Line . . . . .	15.8	7.94
Intermediate cylinder, North Line . . . . .	24.8	28.19
do. South Line . . . . .	26.7	30.55
Low-pressure receiver, North Line . . . . .	5.85	6.38
do. South Line . . . . .	5.73	6.25
Low-pressure cylinder, North Line . . . . .	8.18	24.90
do. South Line . . . . .	8.81	26.81
Transfer chamber, North Line . . . . .	4.92	14.88
do. South Line . . . . .	4.12	12.46
Horse power, North Line . . . . .	112.45	120.27
do. South Line . . . . .	120.27	120.27
Total horse power . . . . .	232.72	232.72
Revolutions per minute . . . . .		373.3
Gauge pressure . . . . .		182.0
Vacuum . . . . .		25.5
Kilowatt output . . . . .		139.4
Electrical horse power . . . . .		186.9
Efficiency . . . . .		80%

Eight indicators were necessary to obtain the horse power developed by each engine. A typical record of one set of cards is shown in the table.

Cards were taken every half hour during each test. The results of the cards taken during the test of November 26th are shown in the following table:

Time,	Card.	I. H. P.	E. H. P.	Efficiency per cent.
After test.	1	25.08	.....	Friction
After test.	2	32.36	.....	Friction
After test.	3	32.36	.....	Friction
3:15 p. m.	7	232.72	186.9	79.96
3:45	8	226.58	177.4	78.29
4:45	9	214.25	168.4	78.6
5:15	10	217.5	171.4	78.85
5:45	11	218.6	172.2	78.77
6:15	12	222.12	176.9	79.64
6:45	13	209.83	164.4	78.35
7:15	14	215.50	176.4	81.83
7:45	15	224.66	182.1	81.05
8:15	16	227.49	180.3	79.25
8:45	17	208.64	162.5	77.88
9:15	18	202.15	156.8	77.56
11:15	21	246.24	196.5	79.8
11:45	22	237.88	190.3	80.
Average indicated horse power, 217.				
Average electrical horse power, 172.				
Average all-day efficiency, 79.3 per cent.				

A typical graphical log of the boiler tests is shown by Fig. 7, which gives a comprehensive record of the data obtained on the last test made November 26, 1897, while the data obtained on the engines and generator during the same time are plotted in Fig. 8. These logs, taken in connection with the table of results, give a complete record of the power-house performance on that day.

The coal had a theoretical evaporative power of 10.5 lbs. of water from and at 212° F., and actually evaporated 6.6 lbs., giving for the efficiency of the furnace and boiler 62.86 per cent. This low efficiency is to be expected because of the boiler being 26 per cent underloaded. The equivalent evaporation per lb. of combustible was 8.22, so that the efficiency of the boiler alone is 78.3 per cent. The boiler then loses by radiation, convection, and through escaping gases 21.7 per cent of the original heat units, while the furnace is to be charged with 15.44 per cent of the lost heat, and 62.86 per cent appears in the steam.

The economizer did not give satisfactory results on the test shown. This is not the fault of the economizer, however, but is due rather to the unfavorable conditions under which it was installed and is operated. Several large cracks in the brickwork flue leading from the uptakes of the boilers to the economizer on the outside of the power house allow air to infiltrate to such an extent that the flue gases are cooled fully 100° before reaching the economizer. In spite of this fact, however, the economizer upon some of the other tests effected an economy of 7 per cent, as figured from the gain in temperature of the feed-water. A graphical log of the boiler test made November 5 is shown in Fig. 9, which indicates a rise of 75.7° F. in the feed-water due to the action of the economizer. This log also shows the amount of coal required for banking the fires over night. Upon this test, however, a larger amount of coal was burned in the boilers, and thus a greater amount of flue gases passed about the economizer pipes. During the latter part of the test on November 26, the economizer was cut out of service.

The pumps used 14.36 per cent of the water evaporated by the boilers. The feed-water, however, was heated by the pump exhaust from a temperature of 97.4° F. to a temperature of 202° F., resulting in a gain of 9.25 per cent. The fuel, then, to be charged against the pumps is only 14.36 per cent, less 9.25 per cent, or 5.11 per cent of the total fuel burned.

The test shows that the engines used 18 lbs. of steam per indicated horse-power. The conditions of the test were not favorable to either an accurate engine test or to the most economical operation of the engines. The steam pressure was lower than it should have been, while the vacuum was but 24.25 in. The engines were also overloaded during the entire run, and were operated at 363 instead of 380 r. p. m. The difference in the power developed by the two lines of cylinders is due to an improper adjustment of the cut-off on the north line. With a few changes there is no doubt but that a material improvement can be made in the duty of the engines.



The indicator cards taken with one engine operating one generator, running on open circuit, show a friction load of 32.26 i. h. p. This is but 14.86 per cent of the average, and is a very satisfactory figure.

The average efficiency between the horse power developed in the cylinders and the electrical power delivered on the switchboard is shown to be 79.27 per cent, which is also satisfactory.

The commercial efficiency of the generator (including the leads to the switchboard) at this load is 79.27÷85.14, or 93.1 per cent, which is all that can be expected of a generator running 32 per cent below its rated capacity.

The total station efficiency from coal pile to switchboard is 5.58 per cent. It may be of interest to compare this result with some other modern station. The Chicago Edison Company in its Harrison street station, produces electrical energy for .3 of a cent per kilowatt-hour burning coal containing 13,000 British thermal units per pound, and costing delivered \$1.05 per ton. The efficiency of that

Results of Tests on Engines, Generators and Auxiliaries.

ITEMS.	Units.	Determinations.
Number of test.....		3
Date of test.....		Nov. 26th
Duration of test.....	hours	9
<i>Water.</i>		
Total water hauled by pumps.....	lbs.	43,440
Water used by economizer engine.....	lbs.	350
Water used by stoker engine.....	lbs.	332
Water used by air and feed pumps.....	lbs.	6,240
Water used by calorimeters.....	lbs.	90
Water escaping through leaks, estimated liberally two per cent. total.....	lbs.	868
Water not used by engine.....	lbs.	7,880
Per cent. total water not used by engine.....	%	18.12
Per cent. total water used by pumps.....	%	14.30
Total water used by engine.....	lbs.	35,560
Per cent. moisture in steam at engine.....	%	1.20
Total dry steam used by engine.....	lbs.	35,133
for moisture.....	lbs.	3,993
Average dry steam used by engine per hour.....	lbs.	363
<i>Engines.</i>		
Average speed of engine.....		24.25
Average vacuum.....		171.3
Average gauge pressure.....		217
Average indicated horse power.....		246
Maximum indicated horse power.....		202
Minimum indicated horse power.....		1,951.8
Total indicated horse power hours.....		18
Pounds dry steam per indicated horse power hour.....		176.5
<i>Dynamo No. 4.</i>		
Average volts.....		727.0
Average amperes.....		128.3
Average kilowatts.....		67.5
Per cent. of full load.....		1,154.7
Total kilowatt-hours output.....		1,238.3
Average kilowatt output of all dynamos.....		1,154.7
Total electrical horse power hours.....		1,547.8
Maximum kilowatt output.....		156.48
Load factor (average watts divided by maximum watts).....		.52
Watts used by cooling tower motor.....		7,568
Kilowatt-hrs. used by cooling tower motor.....		68.1
Net kilowatt-hours output.....		1,086.6
<i>Efficiencies.</i>		
Average efficiency E. H. P. divided by I. H. P.....		79.3
Pounds water evaporated per indicated horse power hour.....		32.25
Pounds coal burned per indicated horse power hour.....		3.58
Pounds water evaporated per net kilowatt-hour.....		40.0
Pounds coal burned per net kilowatt-hour.....		6.44
Indicated horse power hour per lb. coal.....		.298
Watt hours per lb. coal.....		155.2
<i>Costs.</i>		
Coal per ton.....		\$1.99
Total cost of coal burned.....		6.65
Cost of coal per net kilowatt-hour.....		.00611

### RESULTS OF BOILER TESTS.

ITEMS.	Units.	Determinations.
Number of trial.....		3
Date of trial, 1897.....		Nov. 26th
Duration of trial.....	hours	9
Number boilers in operation.....		1
State of weather.....		Rainy
<i>Dimensions.</i>		
Kind of boiler.....		Heine horizontal tubular.
Dimension of shell, diameter and length.....	feet	48"x19'9 1/4"
Number and diameter of tubes.....		87-3 1/2"
Grate surface 8 1/2" wide, 78" long, area.....	sq. ft.	45.5
Water-heating surface.....	sq. ft.	1,497
Ratio of water-heating surface to grate surface.....		30.9
<i>Average Pressure.</i>		
Steam pressure in boiler, by gauge.....	lbs.	168.3
Absolute steam pressure.....	lbs.	183.0
Force of draft in inches of water at stack.....	in.	.58
Force of draft in inches of water at boiler.....	in.	.52
<i>Average Temperatures.</i>		
External air.....	deg.	30.0
Fire room.....	deg.	45.3
Steam.....	deg.	374.2
Feed-water.....	deg.	192.0
<i>Fuel.</i>		
Kind of coal.....		Fairmount, W. Va.
Total amount of coal consumed.....	lbs.	7,000
Moisture in coal.....	%	6.32
Dry coal consumed.....	lbs.	6,558
Total refuse, dry.....	%	13.14
Total combustible (dry weight of coal less refuse).....	lbs.	5,638
Dry coal consumed per hour.....	lbs.	728.6
Combustible consumed per hour.....	lbs.	626.4
Calorific power by calorimeter, B. T. U., per lb.....		10,145
Theoretical evaporative power from and at 212 deg. Fahr. in pounds water per pound coal.....		10.51
<i>Results of Calorimetric Tests.</i>		
Quality of steam, dry steam being taken as unity.....	%	995
Percentage of moisture in steam.....	%	5
<i>Water.</i>		
Total weight of water pumped into boiler and apparently evaporated.....	lbs.	43,440
Water actually evaporated, corrected for quality of steam.....	lbs.	43,323
Factor of evaporation.....		1.07
Equivalent water evaporated into dry steam from and at 212 deg. Fahr.....		46,356
Equivalent water evaporated into dry steam from and at 212 deg. Fahr. pr. hr.....	lbs.	5,150.6
<i>Economic Evaporation.</i>		
Water actually evaporated per lb. of dry coal from actual pressure and temp.....	lbs.	6.60
Equivalent water evaporated per lb. of dry coal from and at 212 deg. Fahr.....	lbs.	7.06
Equivalent water evaporated per lb. of combustible from and at 212 deg. Fahr.....	lbs.	8.22
<i>Commercial Evaporation.</i>		
Equivalent water evaporation per lb. dry coal with one-sixth refuse at 70 lbs gauge pressure, from 100 deg. Fahr.....	lbs.	5.96
<i>Rate of Combustion.</i>		
Coal square feet grate surface per hour.....	lbs.	16.0
Consumption of dry coal per hour, coal assumed at one-sixth refuse—		
Per square foot grate surface.....	lbs.	16.74
Per square foot water htg. surface.....	lbs.	.534
<i>Rate of Evaporation.</i>		
Water evaporated from and at 212 deg. Fahr. per square foot htg. surface pr. hr.....	lbs.	3.66
Water evaporated per hour from 100 deg. Fabr. into steam of 70 pounds gauge pressure—		
Per square foot grate surface.....	lbs.	98.46
Per square foot water htg. surface.....	lbs.	3.18
<i>Commercial Horse Power.</i>		
On basis of 30 lbs. water per hour evaporated from 100 deg. Fahr. into steam of 70 lbs. gauge pressure (equals 34 1/2 lbs. from and at 212 deg.).....	H. P.	149
Horse power, builders' rating at 7 square feet of heating surface per horse power.....		200
Per cent. developed below rating.....	%	26.5
<i>Efficiency.</i>		
Percentage of total calorific power utilized.....	%	62.86

station, therefore, is  $(1.05 \times 1,000 \times 3.43 \times 100) \div (.003 \times 2,000 \times 13,000)$ , or 4.61 per cent. This indicates that the net efficiency of the plant tested is 20 per cent better than that of the Edison station. The Edison station has an output of over 3,000 h. p., while the Englewood station has a maximum capacity of 500 h. p., which makes the comparison more striking.

The cost of fuel for a net kilowatt-hour on the switchboard is shown to be .611 cent. This high price is to be explained, then, not by the inefficiency of the station, but by the fact that a high price is paid for a poor coal. With a more advantageous arrangement in the purchase of coal there is no reason why this station should not develop a kilowatt-hour for less than .3 cent.

### DATA ON BATTERIES OBTAINED AT TIME OF POWER-HOUSE TESTS.

Two complete power-house tests made on November 5 and November 26, 1897, showed the amount of coal required to deliver a kilowatt-hour upon the switchboard. At the same time a complete log of the operation of the battery-charging pit was kept, which shows the history of each battery for the entire time of the test. In the test made November 5 the batteries were charged by the "three-voltage" method, but on November 26 the station was operated with one generator, and but one voltage was used to charge the batteries. During the latter part of this test the tracks became covered with ice, due to a sleet-storm, and it became necessary to change the batteries every half trip, which will account for the shorter time of charging indicated upon the latter part of the power-station log of the test, and also the smaller average number of miles per trip shown November 26. The data obtained at the charging tables were checked up with the conductors' reports. These reports show the number of the car, the time occupied by each trip, the length of the run, and the number of the battery used. The following table shows a summary of this information for the two days. This table shows the bat-

tery mileage for each day from the time of starting the road in the morning until the last trip at night.

TABLE OF BATTERY MILEAGE

No. of Battery.	November 5th.		November 26th.	
	No. of Trips.	Miles Run.	No. of Trips.	Miles Run.
1	2	33.0	...	...
2	2	22.4	...	...
3	4	66.9	3	44.5
4	1	11.8	3	66.9
5	5	100.7	2	33.9
6	4	67.2	5	56.6
7	4	68.4	6	77.0
8	...	...	...	...
9	3	43.6	3	41.4
10	5	49.5	4	53.7
11	...	...	5	58.6
12	5	79.6	...	...
13	1	11.5	6	68.1
14	1	23.0	...	...
15	1	11.5	5	77.8
16	...	...	...	...
17	...	...	...	...
18	...	...	...	...
19	1	11.5	4	62.2
20	...	...	5	56.9
21	5	80.2	2	34.2
22	5	79.0	4	55.4
23	1	10.6	...	...
24	...	...	...	...
25	3	47.1	3	57.2
26	5	79.6	2	22.4
27	1	10.6	4	57.2
28	1	11.8	3	50.6
29	4	79.0	4	56.3
30	4	73.9	4	31.2
31	2	45.4	...	...
32	6	68.1	...	...
33	4	79.3	4	56.2
34	4	78.4	2	34.2
35	...	...	6	89.9
36	...	...	5	78.7
37	3	67.8	3	35.1
38	4	81.6	3	46.0
39	...	...	...	...
40	5	77.8	5	67.8
41	4	80.1	6	90.2
42	4	68.1	3	30.6
43	2	22.6	4	43.4
44	4	80.2	3	34.2
Average miles each trip....		1,821.8	123	1,668.4
		16.56		13.56

This table shows the actual number of miles which the batteries ran the cars on the two days. In addition to this, batteries were used to operate the auxiliary motors of the plant. These motors are upon the transfer carriage used to handle the batteries in the charging pits and upon the transfer carriage used to move the cars in the car barns. No record was obtained of the power used by these motors. A recording wattmeter was secured to place in these auxiliary circuits, but unfortunately it was injured in transportation and could not be used. An effort was made to obtain an average value of the power used for each operation, by means of readings made at intervals of two seconds upon standard volt and ampere meters, but owing to the sudden fluctuations the data obtained were unsatisfactory. However, as the power used in the operation of handling the batteries in the pits and the cars in the barns may properly be charged to the operation of the cars, the total amount of energy delivered to the charging tables divided by the actual car mileage will give the total power required per car-mile. With the data at hand, however, this entire energy cannot be exactly divided into the amount used in the barns and the amount used on the road. The former amount will be a very small proportion of the latter, but this proportion will increase as the average length of battery trips decreases.

The power delivered to the switchboard and the amount of coal required upon November 5 is shown in the records of the test made that day. The power delivered upon November 26 was obtained for nine hours from the records of the test made from 3 p. m. to 12 m., and for the remainder of the day from the charts of the recording ammeter. The readings of this ammeter were

carefully compared with the readings upon a standard ammeter, and found to be correct. These ampere readings were multiplied by the value of the average voltage found upon the test made that day, and the resulting watts added to those obtained during the test.

The following table shows a summary of the results of the two day's run:

Date of test.....	Nov. 5th	Nov. 26th
State of weather .....	Rainy	Rainy and cold
Kilowatt hours delivered to switchboard .....	2,638.	2,895.
Kilowatt-hours used by cooling tower motor .....	151.	174.
Net kilowatt-hours delivered to charging bus-bars .....	2,487	2,721
Total number of car-miles .....	1,821.8	1,668.4
Kilowatt-hours on switchboard per car-mile.....	1.37	1.63
Pounds of coal per net kilowatt-hour.....	6.9	6.44
Pounds coal per car-mile.....	9.45	10.50
Cost of coal per ton .....	\$1.90	\$1.90
Cost coal per net kilowatt-hour.....	.00655	.00611
Cost coal per car-mile.....	.00597	.00996

It will be noticed that although the cost of a kilowatt-hour upon the switchboard was less in the second test, the cost of fuel per car-mile the same day was something more than in the test November 5. This result is due to the fact that the kilowatt-hours required per car-mile were greater in the second case. The difference in the amount of energy required per car-mile is to be explained by the presence of a coating of ice upon the rails during the latter part of the day (November 26). It is unfortunate that a freezing sleet-storm should have occurred at this time, though the results of the test indicate to a certain extent the amount of power required to operate the road under adverse conditions. Owing to the storm, the results of the two tests do not furnish a fair basis for a comparison of economy of the two different methods of charging the batteries.

#### EFFICIENCY TEST OF BATTERY ON CAR.

This test was made November 8, 1897, and was made to determine the efficiency of a battery under actual operating conditions. The battery was charged in the regular way by means of the three-voltage method. It was then discharged while making a round trip, and was then placed upon the charging table and again charged, thus giving two charges and one discharge to determine the efficiency. The battery used was one which had operated at that time over 8,000 miles, and was taken for the purpose of this test immediately after it had made a trip similar to the one upon which it was tested.

The current and voltage upon the two charges were obtained by means of standard instruments, and readings were taken every five minutes. The data are shown plotted graphically in Figs. 10 and 11, in which the abscissæ represent time in minutes.

The observations made upon the car while the battery was discharging consisted in taking voltage and ampere readings every five seconds, while the car was in motion, the time between stops and the length and location of each stop, and a continuous record of the speed.

The voltmeter was a standard Weston instrument and was connected across diagonal corners of the battery tray.

The voltmeter was so connected that it gave the voltage at the battery terminals for each combination. The car tested was 20 ft. long in the body, 30 ft. long over the platforms, and had a seating capacity of 28 passengers. The car weighed 13½ tons with the batteries, the batteries and trays adding about 4 tons to the usual weight of a car of that size.

The motor upon the car was a 50-h. p. Walker four-pole series motor. The entire current used at any one time passed through the armature, so that the ammeter was inserted in the positive brush leads. The ammeter used was of the round-pattern Weston type, and had been found to be correct by comparison with a standard. Five observers were used to obtain the ammeter and voltmeter readings; one called the time every five seconds, two read the instruments, and the other two kept the records. At time of starting the instruments were read oftener than at five-second intervals. A trial trip was made with another battery to get the observers acquainted with their positions, and as the



fluctuations in the current were not violent nor many, it is believed that the results represent very nearly the actual facts.

The duration of the stops and the time the car was in motion between stops was obtained by means of a stop watch.

The record of speed was obtained by means of a Boyer speed recorder belted, by means of a flexible belt, to the car axle. By means of pressing lightly upon the recording pencil a dot was made in the speed curve every five seconds.

The record of the speed recorder has been transferred to a larger scale and is shown in Fig. 12. The same diagram has been used to show the kilowatt-hour and elapsed-time curves. No attempt was made to indicate upon this diagram the ampere or voltmeter readings, as this information is given upon a larger scale in the acceleration tests.

The test may be divided in four parts, as follows:

	Distance.	Time.	No. of stops.	Average speed miles per hour.
1. Power house to Blue Island . . . . .	5.9	28:20	12	12.5
2. Blue Island to power house . . . . .	5.9	29:55	19	11.8
3. Power house to Sixty-third St. . . . .	5.3	27:40	13	11.5
4. Sixty-third St. to power house . . . . .	5.3	27:50	13	11.5
<hr/>				
Total number of stops . . . . .			57	
Total time from start, not including stops . . . . .				113:45
Total distance . . . . .	24.40			miles
Length of one back-up stop, 18 . . . . .				.04 "
Total distance traveled . . . . .	22.44			"
Average speed . . . . .				11.84 miles per hour

In making the stops an effort was made to approximate actual service and in every way reproduce the conditions of an actual trip. No regular passengers were carried, however, the load consisting of nine observers, the motorman and conductor. The motorman was instructed to follow his usual custom of coasting, where possible. The track was dry for the first two parts of the test, but during the last two parts it was raining and the tracks were wet. The energy taken from the battery was as follows:

	Distance. Miles.	Watt-hours	K. W. hours per car-mile.
1. Power house to Blue island . . . . .	5.9	5,533.1	.920
2. Blue Island to power house . . . . .	5.94	5,098	.868
3. Power house to Sixty-third street . . . . .	5.3	4,394.6	.820
4. Sixty-third street to power house . . . . .	5.3	4,689.6	.885
<hr/>			
Total . . . . .	22.44	19,715.3	.878

It is to be regretted that a profile of the road cannot accompany this report. The road, however, is practically level. The results of the last table would seem to indicate that in general the grade rose from the power house toward the two terminals.

The efficiency of the battery is shown as follows:

Kilowatt-hours, first charge . . . . .	36.757
Kilowatt-hours, discharge . . . . .	19.715
Kilowatt-hours, second charge . . . . .	31.631
Efficiency (discharge ÷ first charge) . . . . .	53.6 per cent
Efficiency (discharge ÷ second charge) . . . . .	62.32 per cent

The graphical log of the two charges is shown in Figs. 10 and 11, and it will be seen that they differ considerably. This is due to the fact that the charging of the battery was left to the regular operators of the plant, who used their judgment both as to the voltage and as to the time the battery should charge at each voltage. They also determined when the battery was fully charged. In the first charge there is no doubt but that the final voltage was too high, and in the second charge it would seem that the battery was charged too long, both of which conditions reduced the efficiency obtained. The result, however, shows the efficiency in actual service, but does not represent the possibilities of the battery.

The amount of the first charge was, of course, influenced by the immediate previous history of the battery, and for this reason the efficiency obtained by using the second charge as a basis is the more reliable. This test showed that the car used 1.41 kilowatt-hours per car-mile, as measured at the charging table, and .87 kilowatt-hour per car-mile was delivered from the batteries to the motor on the car.

### ACCELERATION TESTS.

In the tests made upon a car in actual service no opportunity was afforded for accurate acceleration tests. These were made November 13, 1897, upon a straight stretch of track along Vincennes road, extending south from the power house. In these tests the same instruments and observers as on the other car test were used, and readings were taken in much the same way, with the exception that in this test the observations were made at the time of passing from one point to another of the controller. After the fifth point was reached the readings were taken at five-second intervals. The time between points was obtained by means of a stop watch, and no effort was made to change the motorman's method of procedure in bringing the car up to speed. The average results of five trials are shown graphically in the curve, Fig. 13, which shows clearly the power delivered by the batteries at the different points of the controller and the energy required to accelerate the car.

The current curve shows a maximum of 320 amperes. It will be noticed, however, that at this time all four sets of batteries are in parallel, so that this total of 320 amperes indicates a total discharge rate of each cell of but 80 amperes. The dotted curve below the current curve indicates the actual discharge rate of the individual cells. At the fourth notch it coincides with the total current curve, and at this point indicates the highest discharge rate, which is seen to be 220 amperes, and this rapidly decreases until it reaches 100 amperes, which may be taken as a fair value of the current with the car in full motion. It is to be understood, of course, that the practice of coasting, in which the current is shut off, makes it impossible to obtain the power required per mile from this curve.

In conclusion it may be said that the foregoing tests do not demonstrate the best results that may be expected of accumulator traction, and were not made for that purpose. No excuse is to be offered for the fact that the road was not operating under ideal conditions while being tested, as the primary object of the test was to determine where improvement could be made. If this is kept in mind when comparing the results with those obtained upon the trolley systems of about the same size, it will be seen that the cost of fuel for accumulator traction, of something less than 1 cent per car-mile, is very favorable to storage-battery traction. The improvements suggested by the test are now being made. The overhauling of the engines, the repair of the economizer flue and the securing of a better coal than was used on the test, at a cheaper price, should bring the fuel cost per car-mile well within .5 cent. Figures upon the labor and maintenance factors in the cost per car-mile would be of interest in this connection, but are not covered by the figures of the test. The labor account will no doubt be as small as that of any nine-car road, while figures upon maintenance would be premature at this time. The batteries have operated from 8,000 to 14,000 miles and are standing the service remarkably well, so that the maintenance account, up to the present, has been comparatively small.

### PROSPERITY IN SPRINGFIELD, O.

The annual report of S. L. Nelson, general manager of the Springfield (O.) Street Railway Company, shows that there were collected 835,300 cash fares, 857,912 tickets and 352,331 transfers, making a total of 2,045,543. The car mileage was 870,016, a daily average of 126 miles for each car. The average passenger fare was 4.52 cents. For January, 1898, 37,836 more passengers were carried than in the same month of last year. The remarkable showing was in the number of accidents, only two persons being injured and these but slightly.

### THE WRIGHT WAVE MOTOR.

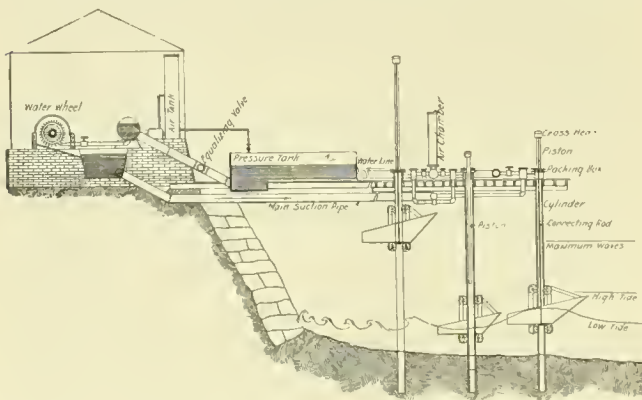
For some years experiments have been carried on in California to determine the merits of various wave motors. The motor herewith illustrated is the invention of Parvin Wright, who, after some preliminary experiments in January, 1897, organized the Wright Wave Motor Company. In June, 1897, the Los Angeles Ocean Power Company was organized to build a plant on the coast and transmit power to Los Angeles. Such installation was made at a point on the ocean beach three miles north of Redondo and about 18 miles from Los Angeles, to which has been given the name Potencia. A wharf 26 ft. wide was built out to a distance



WRIGHT WAVE MOTOR AT POTENCIA.

of 350 ft., at which point the swells usually begin to break, and three motor floats placed at the outer end.

The energy of the waves is utilized by means of floats which operate vertical hydraulic compressors, or pump cylinders, which are in turn connected with a large storage pressure tank of heavy steel. The movement of the waves raises and lowers these floats, and in doing so, pumps fresh water from a small reservoir into the pump cylinders and forces it into the storage pressure tank, where by compressing the air contained in the tank the water becomes subjected to a very heavy pressure. It flows out of the tank through a nozzle and impinges upon the buckets of a Pelton water wheel, by which is driven the dynamo or other machine to be operated. From the water wheel the water flows back to the reservoir from which it was originally



THE WRIGHT WAVE MOTOR.

taken, as is shown in the line drawing of the apparatus.

The accumulated pressure in the pressure tank exerts itself upon the pump pistons, so as to offset the weight of

the floats tending to draw such pistons down; the result is, that during storm periods, the floats ride upon the crest of the waves and are not permitted to drop into the trough of the sea. Mr. Wright is the first inventor to overcome this difficulty, which has heretofore been considered insurmountable.

The wharf at Potencia is a substantial structure with the three floats placed side by side in a line at right angles to its length. When the plant is enlarged the plan is to place the floats in three or more rows, as is indicated in the line drawing.

The half-tone engraving is from a photograph of the Potencia wharf and motors; when this was taken two only of the three floats were in operation.

By reports of tests made on 16 consecutive days in December last, during which the condition of the sea and weather varied from calm to stormy, and the number of waves per minute from 3 to 8, the power developed varied from 2.3 to 3.5 h. p. per float; this is the power developed at the water wheel. It is stated that the variations in the power developed were due to varying conditions under which the motor was tried. Engineers who have examined the plant report that 100 properly constructed floats might be relied upon to develop 5 h. p. each.

The cost of a plant, together with an electrical transmission line, to deliver 1,000 h. p. at Los Angeles, is placed at \$174 per horse-power.

### THE FARE IS TOO LOW.

At a recent session, the Massachusetts Railroad Commissioners were called upon to consider a petition from the Braintree & Weymouth Street Railway Company, which wishes to abolish free transfers on its line because the business on the South Weymouth branch does not pay the running expenses. The petition is an unusual one, and the matter has been taken under advisement by the board. The road is unfortunate in having commenced by issuing free transfers when the business did not justify it, and will no doubt find it a very difficult matter to increase the rate.

### MAIL CONTRACTS IN THE WEST.

The Post Office Department has awarded the contracts for carrying the mail from Seattle, Wash., to the suburban towns, to the local electric lines. The Seattle Traction Company will make one round trip per day between the city and Green Lake for \$100 per annum. The Grant Street Railway Company receives \$200 per annum for the service between South Park and Seattle, making two trips on week days and one on Sundays. The Third Street & Suburban Railway Company has the contract for a daily service to Latona, for \$50. From Seattle to Renton the contract has been awarded to the Seattle & Rainier Beach Railway Company; the service to Columbia City, which is between the two places, will be twice a day, and to Renton once a day.

The Commissioners of the District of Columbia have granted the petition of the Capital Traction Company and issued an order amending the police regulations of the city so that the use of salt on the street railway tracks is forbidden.



## OPERATING EXPENSES OF CONNECTICUT RAILWAYS.

The annual report, for the fiscal year ending September 30, 1897, by the Connecticut Railroad Commissioners, indicates that the street railways of that state are in anything but a prosperous condition. The report includes statements from 29 street railways, two more than last year. During the year 33.8 miles of new track were laid. The gross earnings for the year were \$2,626,227, a slight increase, but the average earnings per car-mile were but 19.60 cents, a decrease over the preceding year. The average dividends dropped from 3.7 to 2.8 per cent. The traffic on the majority of the railways decreased, but the operating expenses were also diminished by close management. The tables give the itemized operating expense account in dollars per car-mile. The figures for the miles of track are for the number of miles of single track, including sidings.

### BRIDGEPORT RAILWAY COMPANY.

Length of railway, measured as single track is 48.6 miles with 1.2 miles of sidings and switches. The company owns 53 closed, 51 open cars, 7 snow plows, 2 sweepers and 1 sprinkler; employs 200 men and carried 5,922,033 passengers with a car mileage of 1,805,412. The operating expenses were 54.4 per cent of the gross earnings, and 3.28 passengers were carried per car-mile.

The expense items were:

Repairs of roadbed and track.....	.0009
Repairs, buildings . . . . .	.0007
Repairs, electric line construction.....	.0009
Removal of snow and ice.....	.0015
Repairs of cars.....	.0071
Harness, hay, etc. . . . .	.0008
Electric motive power . . . . .	.0115
Wages for transportation.....	.0488
Damages, gratuities to persons, etc.....	.0065
Salaries . . . . .	.0058
General expense account . . . . .	.0095

Total expenses per car-mile.....	.0940
Gross earnings per car-mile.....	.1727

### BRISTOL & PLAINVILLE TRAMWAY COMPANY.

This company operates 5 closed cars, 8 open cars, and 1 snow plow, on 7.75 miles of track; there are 30 employees. During the past year 786,019 passengers were carried and 209,621 car-miles run. The operating expenses were 76.8 per cent of the gross earnings, and 3.27 passengers were carried per car-mile run.

Repairs of roadbed and track.....	.0100
Repairs of buildings and fixtures.....	.0005
Repairs of electric line construction.....	.0022
Removal of snow and ice.....	.0008
Repairs of cars . . . . .	.0078
Repairs of electrical equipment of cars.....	.0009
Summer resort . . . . .	.0043
Legal expense . . . . .	.0030
Electric motive power.....	.0250
Wages . . . . .	.0552
Damages . . . . .	.0001
Insurance . . . . .	.0044
Salaries . . . . .	.0070
Supplies . . . . .	.0039
Improvements . . . . .	.0151
Sundries . . . . .	.0035

Total expenses per car-mile.....	.1438
Earnings per car-mile.....	.1872

### CENTRAL RAILWAY & ELECTRIC COMPANY OF NEW BRITAIN.

This company owns 13 closed cars, 23 open ones and 3 snow plows; employs 70 persons and has 18.62 miles of track. During the past year 2,071,339 passengers were carried and 383,871 miles run. The operating expenses were 70.2 per cent of the gross earnings, and 5.14 passengers were carried per car-mile.

Repairs of road bed and track.....	.0111
Repairs of buildings.....	.0002

Repairs of electric line construction.....	.0049
Removal of snow and ice.....	.0023
Repairs of cars . . . . .	.0141
Repairs of electric car equipment.....	.0019
Expense of horses . . . . .	.0008
Electric motive power.....	.0333
Wages . . . . .	.0658
Damages, losses, etc. . . . .	.0006
Insurance . . . . .	.0139
Salaries . . . . .	.0077
Legal expenses . . . . .	.0021
Other operating expenses . . . . .	.0071
Park expense . . . . .	.0055

Total expense per car-mile.....	.1712
Earnings per car-mile.....	.2380

### DANVILLE & BETHEL STREET RAILWAY COMPANY.

The equipment consists of 13 closed cars, 18 open cars, 2 snow plows and 1 sprinkler; 11.15 miles track; 1,218,608 passengers were carried; 337,214 car-miles run. There are 45 persons regularly employed. The operating expenses were 56.9 per cent of the gross earnings, and 3.64 passengers were carried per car-mile.

Repairs of roadbed and track.....	.0031
Repairs of electric line construction.....	.0010
Removal of snow and ice . . . . .	.0005
Repairs of cars . . . . .	.0040
Repairs of car equipment . . . . .	.0039
Blacksmithing . . . . .	.0034
Headlights and fires.....	.0019
Electric motive power.....	.0276
Wages . . . . .	.0447
Insurance . . . . .	.0067
Salaries . . . . .	.0073
Legal expenses, etc. . . . .	.0013

Total expenses per car-mile.....	.1054
Gross earnings per car-mile.....	.1853

### THE DERBY STREET RAILWAY COMPANY.

The rolling stock includes 10 closed and 15 open cars, 3 freight, 1 sprinkling car and 1 snow plow. There were collected 973,060 fares, and 225,035 car-miles run; 22 persons employed. There are 6.29 miles track. The operating expenses were 63.7 per cent of gross earnings, and 4.32 passengers were carried per car-mile.

Repairs of road bed and track.....	.0045
Repairs of buildings and fixtures.....	.0009
Repairs of electric line construction.....	.0016
Removal of ice and snow.....	.0004
Repairs of cars . . . . .	.0074
Repairs of car equipment.....	.0050
Electric motive power . . . . .	.0236
Wages . . . . .	.0528
Damages, etc. . . . .	.0064
Insurance . . . . .	.0007
Salaries . . . . .	.0136
Transportation expenses . . . . .	.0075
Park expenses . . . . .	.0103

Total expenses per car-mile.....	.1347
Earnings per car-mile . . . . .	.2113

### ENFIELD & LONG MEADOW ELECTRIC RAILWAY COMPANY.

There are 5 open, 5 closed cars, and 1 snow plow, running 8.62 miles of track, and 23 men are regularly employed. Last year 236,195 car-miles were run and 446,857 passengers carried. The operating expenses were 73.8 per cent of the gross earnings, and 1.89 passengers were carried per car-mile.

Repairs of roadbed and track.....	.0002
Repairs of buildings and fixtures.....	.0001
Removal of snow and ice.....	.0004
Repairs of cars . . . . .	.0006
Repairs of car equipment.....	.0005
Electric motive power.....	.0141
Wages . . . . .	.0328
Damages . . . . .	.0015
Insurance . . . . .	.0000

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Salaries .....	.0169
General expenses .....	.0033

Total .....	.0704
Gross earnings .....	.0954

## FAIR HAVEN & WESTVILLE RAILROAD COMPANY.

This company operates 53 closed and 46 open cars, 4 snow plows and sweepers on 20.78 miles of track; employs 225 men, carried 6,106,368 passengers, with a car mileage of 1,574,406. There were 3.88 passengers per car-mile, and the operating expenses were 67.3 per cent of the gross earnings.

Repairs of roadbed and track.....	.0124
Repairs of buildings and fixtures.....	.0012
Repairs of electric line construction.....	.0016
Removal of snow and ice.....	.0024
Repairs of cars.....	.0061
Repairs of car equipment.....	.0034
Electric motive power.....	.0123
Wages .....	.0561
Damages .....	.0019
Insurance .....	.0010
Salaries.....	.0135
Sundries .....	.0205

Total expenses per car-mile.....	.1324
Earnings per car-mile .....	.1969

## HARTFORD STREET RAILWAY COMPANY.

This company has 85 open, 77 closed cars, 18 sweepers and snow plows, running on 71.79 miles of track; employs 520 men, carried 11,732,630 passengers, with 2,952,201 car-miles run. The operating expenses were 68.4 per cent of the gross earnings, and 3.94 passengers were carried per car-mile.

Repairs of roadbed and track.....	.0100
Repairs of plant, tools, etc.....	.0020
Repairs of buildings and fixtures.....	.0014
Repairs of steam plant and machinery.....	.0026
Repairs of line construction.....	.0020
Removal of snow and ice.....	.0021
Repairs of cars .....	.0090
Repairs of car equipment.....	.0056
Care of horses .....	.0016
Electric motive power .....	.0195
Wages .....	.0611
Damages, etc. ....	.0026
Insurance .....	.0018
Salaries .....	.0067
Printing .....	.0009
Legal expenses .....	.0005
Car supplies .....	.0021

Total expenses per car-mile.....	.1315
Earnings per car-mile .....	.1922

## HARTFORD, MANCHESTER & ROCKVILLE RAILROAD COMPANY.

There are 15 open and 12 closed cars and 2 snow plows, run on 18.68 miles of tracks. There were 707,498 passengers carried and 301,803 car-miles run; employes, 60. There were 2.34 passengers per car-mile, and the operating expenses were 83.4 per cent of the gross earnings.

Repairs of roadbed and track.....	.0103
Repairs of buildings and fixtures.....	.0007
Repairs of line construction.....	.0041
Removal of snow and ice.....	.0010
Repairs of cars.....	.0148
Repairs of car equipment.....	.0101
Electric motive power .....	.0409
Damages, etc. ....	.0079
Insurance .....	.0024
Wages .....	.0588
Salaries .....	.0158
Rent and miscellaneous expenses.....	.0123

Total expenses per car-mile .....	.1791
Earnings per car-mile.....	.2146

## HARTFORD & WEST HARTFORD STREET RAILWAY COMPANY.

This company owns 13 open and 8 closed cars, 2 snow plows and 10.5 miles of tracks. It carried 514,760 passengers with a car mileage of 249,062; employes, 27. The company leases 2.8 miles of track, making a total of 13.3 miles operated. The operating expenses were 83.2 per cent of the gross receipts, and 2.06 passengers were carried per car-mile.

Repairs of roadbed and track.....	.0090
Repairs of buildings .....	.0001
Repairs of line construction.....	.0003
Removal of snow and ice.....	.0005
Repairs of cars .....	.0026
Repairs of car equipment.....	.0019
Electric motive power.....	.0162
Wages .....	.0465
Damages .....	.0006
Insurance .....	.0009
Salaries .....	.0026
Rent of other roads.....	.0368
Other operating expense .....	.0112
General expense .....	.0114

Total expenses per car-mile.....	.1406
Earnings per car-mile.....	.1690

## MERIDEN ELECTRIC RAILROAD COMPANY.

The road is equipped as follows: 25 open and 22 closed cars and 4 snow plows, operating on 17 miles of track. The passengers carried numbered 2,088,180 with a car mileage of 601,769; employes, 78. The operating expenses were 80.7 per cent of the gross earnings, and 3.47 passengers carried per car-mile.

Repairs of roadbed and track.....	.0064
Repairs of buildings and fixtures.....	.0009
Repairs of line construction.....	.0021
Removal of snow and ice.....	.0008
Repairs of cars .....	.0036
Repairs of car equipment .....	.0105
Electric motive power.....	.0226
Wages .....	.0529
Care of horses .....	.0014
Repair of trucks .....	.0026
Repair of power plant.....	.0014
Office expense .....	.0058
Legal expense .....	.0005
Park expense .....	.0224
Insurance .....	.0113
Miscellaneous operating expenses .....	.0025

Total expenses, per car-mile.....	.1485
Earnings per car-mile.....	.1851

## MIDDLETOWN STREET RAILWAY COMPANY.

There are 9 open and 4 closed cars with 1 snow plow, running on 4.75 miles of track. The road carried 466,340 passengers with a car mileage of 107,426; employes, 15. The operating expenses were 73.4 per cent of the gross receipts, and 4.34 passengers were carried per car-mile.

Repairs of roadbed and track .....	.0024
Repairs of electric line construction.....	.0005
Removal of snow and ice.....	.0009
Repairs of cars .....	.0054
Repairs of car equipment .....	.0024
Care of horses .....	.0008
Electric motive power .....	.0444
Wages .....	.0551
Insurance .....	.0045
Salaries .....	.0140
Car house account .....	.0119
General expenses .....	.0060

Total expense per car-mile.....	.1483
Earnings per car-mile.....	.2020



## NEW HAVEN & CENTERVILLE STREET RAILWAY COMPANY.

This company owns 10 open and 10 closed cars, 1 snow plow, and 8.07 miles of track. There were carried 270,590 passengers, and 75,102 car-miles run; employes, 33. The operating expenses were 66.1 per cent of the gross receipts, and 3.60 passengers were carried per car-mile.

Repairs of roadbed and track.....	.0000
Repairs of buildings and fixtures.....	.0000
Repairs of line construction.....	.0030
Removal of snow and ice.....	.0018
Repairs of cars.....	.0070
Repairs of car equipment.....	.0029
Electric motive power.....	.0289
Wages.....	.0595
Insurance.....	.0040
Salaries.....	.0071
Miscellaneous.....	.0073
<hr/>	
Total expenses per car-mile.....	.1215
Earnings per car-mile.....	.1835

## NEW HAVEN STREET RAILWAY COMPANY.

There are 39 open and 35 closed cars belonging to this company, also 4 snow plows and 25.5 miles of track. Last year 4,393,729 passengers were carried and 1,191,365 car-miles were run. There are 155 persons employed. This company leases a portion of its track, making a total mileage of 30.75 operated. The operating expenses were 61.2 per cent of the gross receipts, and 3.60 passengers were carried per car-mile.

Repairs of roadbed and track.....	.0061
Repairs of machinery.....	.0022
Repairs of line construction.....	.0016
Removal of snow and ice.....	.0019
Repairs of cars.....	.0109
Repairs of car equipment.....	.0037
Wages.....	.0516
Damages, etc.....	.0010
Insurance.....	.0010
Salaries.....	.0045
Sundries.....	.0035
Boiler and engine room service.....	.0189
<hr/>	
Total expenses per car-mile.....	.1080
Earnings per car mile.....	.1766

## NEW LONDON STREET RAILWAY COMPANY.

This company operates 16 open, 7 closed cars and 2 snow plows on 7.2 miles of track. Last year 1,135,588 fares were collected and 214,347 car-miles run; employes, 25. The operating expenses were 59.3 per cent of the gross earnings, and 5.30 passengers were carried per car-mile.

Repairs of roadbed and track.....	.0062
Repairs of buildings and fixtures.....	.0003
Repairs of line construction.....	.0018
Repairs in power plant.....	.0009
Care of horses.....	.0005
Removal of snow and ice.....	.0039
Repairs of cars.....	.0136
Electric motive power.....	.0180
Wages.....	.0660
Insurance.....	.0114
Salaries.....	.0155
Miscellaneous.....	.0083
<hr/>	
Total expenses per car-mile.....	.1461
Earnings per car-mile.....	.2468

## NORWALK STREET RAILWAY COMPANY.

This company owns 9 open, 11 closed cars, 1 sprinkler and 1 snow plow, together with 8.17 miles of track. Last year 1,042,714 passengers were carried and 241,570 car-miles run; employes, 25. The operating expenses were 67.5 per cent of the gross earnings, and 4.32 passengers were carried per car-mile.

Repairs of roadbed and track.....	.0005
Repairs of buildings and fixtures.....	.0003
Repairs of line construction.....	.0016

Removal of snow and ice.....	.0006
Repairs of cars.....	.0049
Electric motive power.....	.0280
Wages.....	.0573
Damages, etc.....	.0108
Insurance.....	.0006
Salaries.....	.0214
Legal expense.....	.0006
Miscellaneous.....	.0159
<hr/>	
Total expense per car-mile.....	.1425
Earnings per car-mile.....	.2100

## NORWALK TRAMWAY COMPANY.

This company owns 16 open, 9 closed cars, 1 snow plow and 18.33 miles of track. Last year 1,370,495 fares were collected, and 414,530 car-miles run; 50 employes. There were 3.31 fares collected per car-mile, and the operating expenses were 65.7 per cent of the gross earnings.

Repairs of roadbed and track.....	.0037
Repairs of buildings and fixtures.....	.0004
Repairs of line construction.....	.0027
Removal of snow and ice.....	.0010
Repairs of cars.....	.0031
Repairs of car equipment.....	.0019
Electric motive power.....	.0195
Wages.....	.0411
Damages, etc.....	.0001
Insurance.....	.0047
Salaries.....	.0101
Miscellaneous.....	.0080
<hr/>	
Total expenses per car-mile.....	.0963
Earnings per car-mile.....	.1465

## NORWICH STREET RAILWAY COMPANY.

There are operated 14 open and 13 closed cars and one snow plow on 12.46 miles of tracks. Last year 1,852,872 passengers were carried and 296,784 car-miles run; employes, 45. There were 6.24 fares collected per car-mile, and the operating expenses were 67.0 per cent of the gross earnings.

Repairs of roadbed and track.....	.0100
Care of horses.....	.0012
Park expense.....	.0081
Damages.....	.0002
Repairs of line construction.....	.0014
Removal of snow and ice.....	.0029
Repairs of cars.....	.0037
Repairs of car equipment.....	.0095
Electric motive power.....	.0385
Wages.....	.0620
Insurance.....	.0113
Salaries.....	.0184
Operating expenses, miscellaneous.....	.0123
<hr/>	
Total expenses per car-mile.....	.1795
Earnings per car-mile.....	.2677

## PORTLAND STREET RAILWAY COMPANY.

This railway, which has been in operation but 11 months, has 2 closed cars operating, running on 3.2 miles of track, and employs 5 men. The car-miles run during this period were 42,409, and 138,415 fares were collected. The operating expenses were 77.5 per cent of the gross earnings, and 3.27 passengers were carried per car-mile.

Repairs of roadbed and track.....	.0041
Repairs of electric line construction.....	.0001
Removal of snow and ice.....	.0032
Repairs of cars.....	.0013
Electric motive power.....	.0436
Wages.....	.0520
Damages.....	.0003
Insurance.....	.0012
Salaries.....	.0016
General expense.....	.0028
<hr/>	
Total operating expenses per car-mile.....	.1107
Earnings per car-mile.....	.1428

## SOUTHINGTON &amp; PLANTSVILLE TRAMWAY COMPANY.

The 5 employes of this road operate 3 closed cars on 1.57 miles of tracks. Last year 77,721 passengers were carried and 43,249 car-miles made. The operating expenses were 85.1 per cent of the gross earnings, and 1.8 fares collected per car-mile.

Repairs of roadbed and track.....	.0124
Repairs of buildings.....	.0036
Removal of snow and ice.....	.0003
Repairs of cars.....	.0034
Repairs of car equipment.....	.0011
Wages.....	.0334
Insurance.....	.0012
Salary.....	.0020
Coal and supplies.....	.0198
Total expenses per car-mile.....	.0780
Earnings per car-mile.....	.0916

## STAMFORD STREET RAILROAD COMPANY.

The company runs 11 open and 9 closed cars on 11.25 miles of track. Last year 830,338 passengers were carried and 282,147 car-miles run. There are 38 employes. The operating expenses were 78.7 per cent of the gross earnings, and 2.94 fares were collected per car-mile.

Repairs of roadbed and track.....	.0014
Repairs of buildings.....	.0001
Repairs of electric line construction.....	.0011
Removal of snow and ice.....	.0009
Repairs of cars.....	.0015
Repairs of car equipment.....	.0046
Care of horses.....	.0009
Electric motive power.....	.0292
Wages.....	.0495
Damages, etc.....	.0000
Insurance.....	.0082
Other expenses.....	.0154
Total expenses per car-mile.....	.1128
Earnings per car-mile.....	.1433

## WATERBURY TRACTION COMPANY.

This company operates 30 open, 24 closed cars, 1 sweeper and 2 snow plows on 14 miles of track. Last year 3,068,524 fares were collected and 543,824 car-miles run. The employes number 85. There were 5.64 fares collected per car-mile, and the operating expenses were 59.3 per cent of the gross earnings.

Repairs of roadbed and track.....	.0119
Repairs of line construction.....	.0012
Removal of snow and ice.....	.0013
Repairs of cars.....	.0110
Repair of buildings.....	.0004
Team of horses.....	.0007
Electric motive power.....	.0300
Wages.....	.0703
Damages.....	.0008
Insurance.....	.0097
Salaries.....	.0073
Legal expenses.....	.0037
General expenses.....	.0090
Total expenses per car-mile.....	.1582
Earnings per car-mile.....	.2666

## WESTPORT &amp; SAUGATUCK STREET RAILWAY COMPANY.

This company owns 2 open, 3 closed cars and 5.25 miles of track. Last year 169,952 persons were carried and 68,491 car-miles run; employes, 8. The operating expenses of this railway exceed the gross earnings by 1.8 per cent. The fares collected averaged 2.48 per car-mile.

Repairs of roadbed and track.....	.0112
Repairs of buildings.....	.0000
Repairs of line construction.....	.0000
Removal of snow and ice.....	.0004
Care of horses.....	.0013
Electric motive power.....	.0373

Wages.....	.0630
Insurance.....	.0015

Total expenses per car-mile.....	.1147
Earnings per car-mile.....	.1126

WINCHESTER AVENUE RAILROAD COMPANY,  
WEST HAVEN.

This company owns 52 open, 39 closed cars, 4 snow plows and 19.1 miles of track; 5,361,727 passengers were carried and 1,000,379 car-miles run; 150 men are employed. The property of the West Shore Street Railway Company, of West Haven, is leased, making a total of 21.14 miles of track operated. The operating expenses are 53.7 per cent of the gross earnings, and an average of 5.35 fares were collected per car-mile.

Repairs of roadbed and track.....	.0030
Repairs of buildings.....	.0004
Repairs of line construction.....	.0008
Removal of snow and ice.....	.0007
Repairs of cars.....	.0061
Repairs of car equipment.....	.0048
Electric motive power.....	.0247
Wages.....	.0629
Damages, etc.....	.0009
Insurance.....	.0040
Salaries.....	.0086
General expense.....	.0163

Total expenses per car-mile.....	.1332
Earnings per car-mile.....	.2483

## OHIO STREET RAILWAY ASSOCIATION.

The state association of the street railway men of Ohio has recently been reorganized and put upon a firmer basis; the name has been changed from the Ohio Tramway Association to the Ohio Street Railway Association, and the officers propose to exert every effort to make it the best and most progressive of the state associations. Ohio has over 1,200 miles of street railways and the exchange of experimental, statistical and scientific knowledge among the members cannot fail to be of benefit to the companies and to the public which they serve.

The membership fee has been fixed at \$10 for each company and the annual dues at 25 cents for each regular car operated; but the dues shall in no case exceed \$15 per year.

We have received from the secretary a copy of the Constitution and By-laws of the Association; the book is of a size convenient for the vest pocket and is bound in leather. The present officers of the association are: President, A. A. Anderson, Youngstown; vice-president, T. R. Catlin, Canton; secretary and treasurer, Frank J. J. Sloat, Akron; the officers together with H. P. Bradford, Cincinnati; F. L. Nelson, Springfield, and W. F. Kelly, Columbus, constitute the executive committee.

NORTHWESTERN ELECTRICAL  
ASSOCIATION.

The Northwestern Electrical Association held its annual meeting in Milwaukee, where some valuable papers were read, among them being "Long Distance Transmission" by Axel Ekstrom, "Present Efficiency of Incandescent Lamps" by J. E. Randall, "Electricity in Municipal Engineering" by Prof. R. B. Owens, and others. The session was concluded by a banquet attended by a number of distinguished guests, including Governor Scofield.



## ELECTRICAL INSPECTION AND TESTING OF CAR EQUIPMENTS.

### THE HERRICK SYSTEM.

The mechanical wear and tear of a car equipment is evident on inspection, and renewals and repairs can be intelligently made in order to maintain the equipment mechanically, but the electrical troubles are not generally visible until the defect has developed into a fault and the equipment is crippled. The commercial effect of adopting electrical inspection methods immediately results in a large saving in the cost of electrical maintenance, and the character of the work changes from that of repairs to that of maintenance.

The apparatus and methods for electrical inspection and

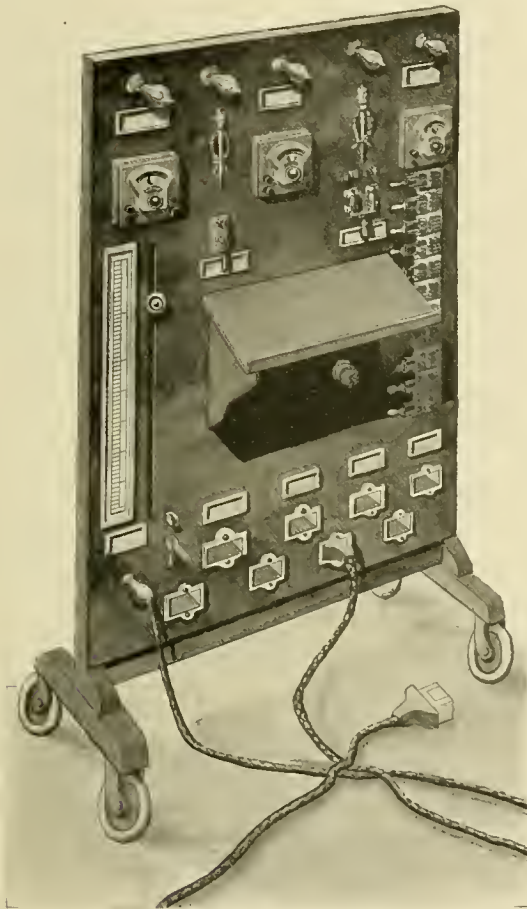


FIG. 1.—PORTABLE TESTING SET.

testing were developed from the necessity of reducing the cost of electrical maintenance, which costs aggregate in all the street railroads in the United States over 18 million dollars per annum.

There are very few faults that lie dormant in an equipment and develop under extra straining, loading, or weather conditions, that cannot be detected and remedied before they develop into a fault, the repair of which will cost many times that of preventive measures.

A number of methods of measuring and testing have been selected for the different tests which are applied to an equipment, each having its own particular advantages for the tests for which it is best adapted. These different methods have all been connected up on a switchboard so that the

interpolating of the apparatus on the plug board, by means of flexible leads, will make the proper connections for that test.

Commercial measuring instruments are used for the different tests, and are so calibrated that they give very reliable results. The methods of applying these tests to an equipment are so arranged that the equipment can be thoroughly tested and every defect located, without disconnecting or disassembling any part of the equipment except the ground connections. Every class of equipment has been standardized, and every point of the controller should give specific readings on the measuring apparatus; if these indications deviate from the standard by a certain amount, the cause can be immediately located. By the use of this method the relative efficiency of the motormen can be determined, if a regular inspection system is maintained, by means of the increase in temperature of the equipments which they bring in. By keeping records of motormen and temperatures, the poor motormen can be readily detected, as motormen running over the same schedule and route, with practically the same traffic, may make a difference of 40° Centigrade in the motors, due only to the improper handling of the controller, which means a waste of energy and depreciation of the equipment. Another large cause of depreciation is the lack of equalization between two or more motors operating under the same car body. This lack of equalization can be readily detected by the practical determinations of the relative temperatures of the several motors, and these can be equalized so as to be maintained at the uniform temperatures, which means working at the best possible advantage. The temperature measurements are not made by a thermometer, but by means of a calibrated rheostat on the testing switchboard, which is calibrated so that the temperature can be read directly on the rheostat when the indicating instrument reads at zero.

The system comprehends the following determinations. All measurements except those marked (\*) can be made without making any disconnection or disassembling of the equipments:

#### WIRING.

1. In new equipments, whether the car is correctly wired.
2. Poor connections in car wiring, and where.
3. Open circuit, and where.
4. Ground on wiring system, and where.

#### CONTROLLERS.

5. Improper connection of controller, and where.
6. Poor contact, and on which point.
7. Short circuit, and between which two contacts.
- \* 8. Poor connections to leads.
9. Where the buttons make contacts at correct points on controller face.
- \*10. Ground in controller, and where.

#### RHEOSTATS.

11. Are they properly connected in.
12. Are they standard resistance on each step.
13. Are they grounded, and on which step.
14. Temperature of the rheostat.
15. Open circuit, and where.
16. Whether the proper rheostat is used for the equipment.

#### MOTOR FIELD.

17. Whether the fields are properly connected.
18. Whether the field has broken down.
19. Whether the insulation is poor between the field and the ground, and which field.
20. Whether they are the proper field coils for the equipment.
21. What is their temperature.

- \*22. Whether they have the proper number of turns.
- 23. Whether they have the proper resistance.
- 24. Whether the connectors are making good connections between field terminals.

## SHUNT FIELDS.

- 25. Whether this is connected around the fields.
- 26. Its resistance.
- 27. Whether the two shunts are carrying equal loads or equally shunting both motors.

## ARMATURES.

- 28. Insulation to ground.
- 29. Brushes making contact with commutators.
- 30. Whether armature strikes pole pieces.
- \*31. Whether there are leaks or crosses between armature coils.
- \*32. Whether there are poorly insulated or short circuited armature coils, and which.
- \*33. Whether the armature is properly connected.
- \*34. Whether the coils are properly soldered to commutator.

## COMPLETE MOTOR TEST.

- 35. What is the temperature of the motor.
- 36. Whether two motors are equalized.
- 37. Whether the motor has been properly handled by the motormen.

The testing system is so arranged that any of the foregoing faults can be detected when the inspector makes three inspection tests. The first is made when the controller is on the first point. The second, when the controller is on the series step on the series-parallel controller, or on the

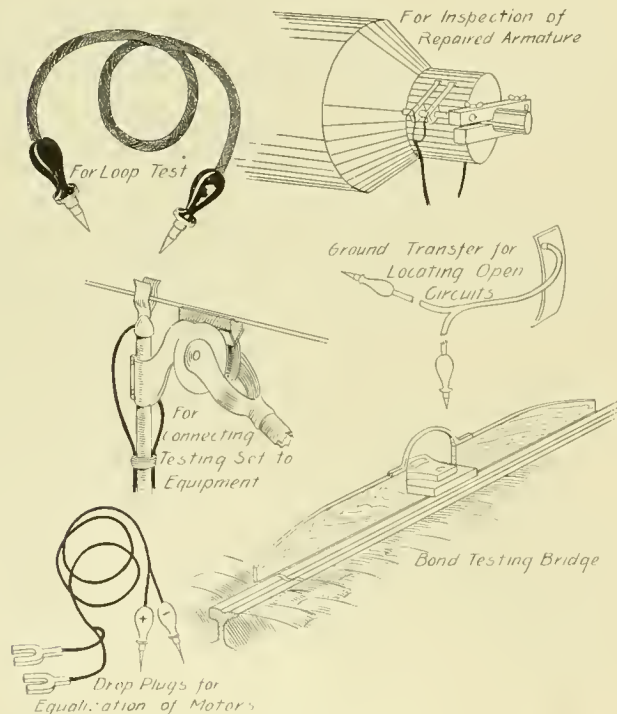


FIG. 2.

parallel step where the rheostat is used. For the third test the ground connection is then removed and the insulation of the equipment is taken. These three measurements, if they are standard, prove the equipment to be in good electrical condition, and if there is any tendency to a break-down, one of the above tests will show that there is trouble. A detailed test, occupying not more than five minutes, will then have to be made in order to locate the point or points where the trouble exists.

For these tests neither a bridge nor the drop method, as usually applied, were found to be sufficiently reliable or expeditious for practical work. The lower e. m. f., under which a bridge is used, may make a carbon brush contact or a bad controller point appear as an open circuit, whereas if higher potentials are used, this will break down to a metallic circuit. The drop method requires that both the voltmeter and ammeter be read, and it also requires the use of mathematics to figure the resistance; as the current value changes at every step of the controller it makes this method too tedious to be applied even for the three inspectors' tests, and as the drop test is usually applied, the contact resistance is also measured, and this seriously interferes with the accurate measurement of low resistances.

In order to readily apply the tests to the car equipments with the portable testing set shown in Fig. 1, the trolley is pulled down and the current is carried first from the trolley wire through the testing set back to the trolley wheel. There is a bank used in series with this circuit in order to regulate the current flow. A ground plate is inserted between the brake shoe and the car wheel, and the brake is brought up tight. These are the only two connections to be made for the tests. In the tests with the stationary switchboard, a trolley wire is run through the car house parallel with the present trolley wire, about 6 in. from it.

In order to test a car it is only necessary to transfer the trolley wheel to the test trolley wire, and the measurements can be made in the inspectors' office. The connections are so made that the resistances external to the car equipment are equalized, regardless of the position of the car.

The tests are made on the car by the movement of the controller handle to the different points. If the equipment is up to standard the balance indicator will stand at zero, when the pointer on a sliding scale is brought to a position on the scale corresponding to the point of the controller under measurement. On account of various combinations made by the controller of the motors, a fault in either or both can be expeditiously located.

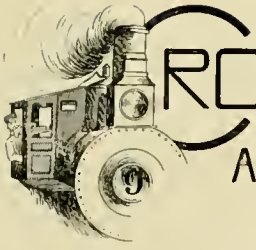
The practical application of these tests brings out clearly the following points:

1. That the lack of equalization between the motors is largely accountable for the condition of one motor continually breaking down.
2. That more armatures are burnt out in weak fields than by the poor insulation of the armature.
3. That flashing of the brushes burns out more armatures than poor insulation between coils.
4. That armatures can be repaired which are often burnt out beyond repair by the motormen in cutting out the motor as soon as it bucks.
5. That the normal life of the motor is reduced 40 per cent by the improper use of the controller.

M. R. McAdoo, general manager of the Paterson Railway Company, who has been using this system, says in regard to it: "This system has proved so simple and direct in its operation that it immediately effected a large saving in our electrical repairs, and we have been able to maintain our equipments electrically by preventive measures, and have reduced electrical break-downs to a minimum. In fact, we have been able to get a much longer life out of our equipments and greatly decrease the expense under which we are operating."

Fig. 2 shows the different auxiliary appliances used by the inspectors in order to obtain the tests required.





# CROSSINGS OF STEAM RAILROADS AND STREET RAILWAYS.

## PART III.

### NEW JERSEY.

The law governing crossings in New Jersey is one approved March 22, 1895, which is as follows:

Be it enacted by the Senate and General Assembly of the State of New Jersey, That whenever the route of any steam or electric railroad hereafter to be constructed shall cross at points outside of the limits of cities the line of any steam railroad in this state, such crossing shall be made in such a way as will inflict the least injury upon the rights of the company owning or operating the railroad intended to be crossed and as will afford proper protection to the public; and no company shall hereafter construct any steam or electric railroad across the line of any steam railroad except within the limits of a city until it shall have first made application to the chancellor of this state to define the mode in which such crossing shall be made, and it shall thereupon be the duty of the chancellor, after causing reasonable notice of such application to be given to the municipal authorities, and also to the corporation owning or operating the railroad intended to be crossed, to define by his decree the mode in which such crossing shall be made and if, in his judgment, it is reasonably practicable and public safety so requires to avoid a grade crossing, he may in his discretion by his decree define and regulate the mode and manner of such crossing, and thereupon such crossings shall be made in the mode defined by such decree, and in no other way.

And be it enacted, That crossings of steam railroads by steam or electric railroads within the limits of cities shall be made subject to the present existing laws in regard to the same.

Under this act the apportionment of cost is made by the court. Usually the viaducts are for the use of the street railway only. When necessary to maintain flagmen at important crossings it is usually done by the street railway. One of the longest viaducts in the state is that built by the Consolidated Traction Company, of Jersey City, over the Delaware, Lackawanna & Western tracks; it is about 1,000 ft. in length and cost \$30,000.

Two very important decisions in regard to grade crossings have been rendered recently by the supreme court of New Jersey. The first was in the case of the Erie Railroad against the city of Newark, for the expense incurred in planking the crossing made necessary by the opening of a new street across its tracks and for the cost of erecting and maintaining gates. The company was allowed for the planking but not for the gates by the lower court; this decision was reversed, the supreme court holding that the taking of a railway's property for street purposes is an action entitling the road to damages, and compensation must include all moneys which the act causes the company to pay out, and the erection and maintenance of gates is an added expense for which the company is entitled to ask compensation. This would appear to be so sweeping that every municipality desiring to open new streets across railway lines will not only have to pay for the right of way, but will be compelled to maintain gates and gatemen there in perpetuity. The effect will probably be to bring about the abolition of grade crossings, since it will be cheaper in the end to cross over or under the railway line than to maintain gates and gatemen.

The second decision relates to flagmen or gates. The Philadelphia & Reading Railroad was convicted of maintaining a nuisance in having neither gates nor flagmen at a certain crossing. The supreme court holds that a railway company is not obliged to take any greater precaution for

the protection of crossings than is exacted by the statutes, the only exception being where a company has created a danger by its own act. The statute enacted in 1852 requiring the railroad in most instances only to ring a bell or blow a whistle when approaching a crossing was amended in 1895 to the extent that the governing bodies of all municipalities in first-class counties are given the power to compel the protection of crossings.

### NEW YORK.

For some years the state of New York has endeavored to reduce the number of railroad grade crossings, including those of highways and streets as well as street railways and other steam roads. In 1893 the law here quoted was enacted, giving to the courts the power to appoint commissioners to decide upon crossings when the two companies interested fail to agree.

Sec. 1. Whenever the railroad or route of any street surface railroad corporation shall intersect and cross, or shall cross the tracks and roadbed of any railroad, operated by locomotive, steam or other power, which are laid in, across or upon the surface of any street, avenue, road or highway in any city, town or village of the state, having less than 500,000 inhabitants, and such street surface railroad corporation having been unable to agree with the corporation owning the tracks and roadbed so intersected or to be intersected and crossed, as to the line or lines, grade or grades, points or manner of such intersection and crossing, or upon the compensation to be made therefor, shall have applied to the court by petition to appoint commissioners to determine the same, the court shall upon application made by such street surface railroad corporation, at, or after, the time of the appointment of such commissioners, or if an answer to the petition of such street surface railroad corporation has been interposed, at any time thereafter, direct that such street surface railroad corporation, be permitted to lay its tracks across and to intersect, upon the surface of the street, avenue, road or highway, the tracks and roadbed of such railroad operated by locomotive, steam, or other power, provided, such street surface railroad corporation shall at the time of obtaining such order make and file with the clerk of said court, its bond or undertaking in writing, in an amount and with surety or sureties to be approved by the court, conditioned for the full and faithful performance by such street surface railroad corporation of any and all conditions and requirements which may be imposed by said commissioners and be affirmed by the court, in determining the line or lines, grade or grades, points or manner of such intersection and crossing and as to the amount of compensation to be paid therefor, and also conditioned to conform such crossing and intersection made by virtue of such order of the court to the requirements made by said commissioners as affirmed by the court.

Sec. 2. No street surface railroad shall be allowed to lay its tracks at grade across the tracks or roadbed of any railroad operated by locomotive steam power at any point where there are three or more tracks of the steam road proposed to be crossed, which tracks have been constructed and in operation at least two years, unless the written consent of the state railroad commissioners be first obtained for such crossing at grade. But this section shall not affect the operation of section one of this act in any suit or proceeding now pending, nor any renewals of said pending suit or proceeding brought for any cause.

In 1897 the railroad law was amended and several provisions as to crossings made, all looking to the abolishment of grade crossings, the act applying to steam roads crossing other roads as well as street railways.

The several portions of this act with a direct bearing on the subject are as follows:

Sec. 60. All steam surface railroads, hereafter built, except additional switches and sidings, must be so constructed as to avoid all public crossings at grade, whenever practicable so to do. Whenever application is made to the board of railroad commissioners, under Sec. 59 of the railroad law, there shall be filed with said board a map showing the streets, avenues and highways proposed to be crossed by the new construction, and the said board shall determine whether such crossings shall be under

or over the proposed railroad, except where said board shall determine such method of crossing to be impracticable. \* \* \* (Provisions as to notice, etc.)

Sec. 61. When a new street, avenue or highway, or new portion of a street, avenue or highway shall hereafter be constructed across a steam surface railroad, such street, avenue or highway, or portion of such street, avenue or highway, shall pass over or under such railroad or at grade as the board of railroad commissioners shall direct. Notice, etc. \* \* \*

Sec. 62. The mayor and common council of any city, the president and trustees of any village, the town board of any town within which a street, avenue or highway crosses or is crossed by a steam surface railroad at grade, or any steam surface railroad company, whose road crosses or is crossed by a street, avenue or highway at grade, may bring their petition, in writing, to the board of railroad commissioners, therein alleging that public safety requires an alteration in the manner of such crossing, its approaches, the method of crossing, the location of the highway or crossing, the closing and discontinuance of a highway crossing and the diversion of the travel thereon to another not at grade, and praying that the same may be ordered; whereupon the said board of railroad commissioners shall appoint a time and place for hearing the petition, and shall give such personal notice thereof as they shall judge reasonable, of not less than 10 days, however, to said petitioner, the railroad company, the municipality in which such crossing is situated, and to the owners of the lands adjoining such crossing and adjoining that part of the highway to be changed in grade or location, and shall cause notice of said hearing to be advertised in at least two newspapers published in the locality affected by the application; and after such notice of hearing the said board of railroad commissioners shall determine what alterations or changes, if any, shall be made. The decision of said board of railroad commissioners rendered in any proceeding under this section, shall be communicated within 20 days after final hearing to all parties to whom notice of the hearing in said proceeding was given, or who appeared at said hearing by counsel or in person. Any person aggrieved by such decision, or by a decision made pursuant to Secs. 60 and 61 hereof, and who was a party to said proceeding, may appeal therefrom to the appellate division of the supreme court in the department in which such grade crossing is situated and to the court of appeals, in the same manner and with like effect as is provided in the case of appeals from an order of the supreme court.

Sec. 63. Whenever, under the provisions of Sec. 60 of this act, new railroads are constructed across existing highways, the expense of crossing above or below the grade of the highway shall be paid entirely by the railroad corporations. Whenever under the provisions of Sec. 61 of this act a new street, avenue or highway is constructed across an existing railroad, the railroad corporation shall pay one-half and the municipal corporation wherein such street, avenue or highway is located, shall pay the remaining one-half of the expense of making such crossing above or below grade; and whenever a change is made in an existing crossing in accordance with the provisions of Sec. 62 of this act, 50 per cent of the expense thereof shall be borne by the railroad corporation, 25 per cent by the municipal corporation, and 25 per cent by the state. Whenever, in carrying out the provisions of Secs. 61 and 62 of this act, two or more lines of steam surface railroad, owned and operated by different corporations, cross a highway at a point where a change in grade is made, each corporation shall pay such proportion of 50 per cent of the expense thereof as shall be determined by the board of railroad commissioners. \* \* \*

\* The legislature shall annually appropriate out of any moneys not otherwise appropriated, the sum of \$100,000 for the purpose of paying the state's proportion of the expense of a change in an existing grade crossing. \* \* \*

Sec. 66. The railroad commissioners may, in the absence of any application therefor, when, in their opinion, public safety requires an alteration in an existing grade crossing, institute proceedings on their own motion for an alteration in such grade crossing, upon such notice as they shall deem reasonable, of not less than 10 days, however, to the railroad company, the municipal corporation and the person or persons interested, and proceedings shall be conducted as provided in Sec. 62 of this act. \* \*

Sec. 68. All street surface railroads hereafter constructed across a steam railroad shall be above, below or at grade of such steam railroad as the board of railroad commissioners shall determine, and such board shall in such determination fix the proportion of expense of such crossing to be paid by the street surface railroad.

Sec. 69. The provisions of this act shall also apply to all existing or future steam surface railroads, on which, after the passage of this act, electricity or some other agency than steam shall be substituted as a motive power.

Buffalo and certain crossings in Rochester are exempted from these provisions.

The regulations of municipalities for the protection of the public at grade crossings by the employment of flagmen and otherwise vary, as also does the practice of apportioning the wages of such watchmen.

#### OHIO.

The law in Ohio prior to 1896 was that the maintenance of crossings should be borne equally by the two roads crossing. The law passed, and approved April 27, 1896, provides for the interlocking of grade crossings and places the subject under the control of the commissioner of railroads. Secs. 1, 2 and 3 of this act are identical with sec-

tions 2, 3 and 4 of the act passed by the Indiana legislature on the same subject in 1897, except that in Indiana the duties of railroad commissioner are given to the auditor of state; the portions regarding the repeal of speed regulations at protected crossings and the penalties for violation are also of the same tenor.

Prior to this act the rulings of the Ohio courts have been that the street railway was not a burden additional to the public easement, and consequently the rule as to crossings was that laid down in the Indiana decision, quoted in the "Review" for October, page 683.

In 1894 the power to condemn property was conferred upon street railways.

City ordinances as to flagmen vary. In some cases the flagman is hired jointly by the two companies, but in most instances by the steam road solely.

The statute for the prevention of accidents (1891) at crossings is as follows:

Sec. 1. Be it enacted by the General Assembly of the State of Ohio. That where the tracks of two street railroads cross each other or in any way connect at a common grade, when one or both such street railroads use other than horse power for propelling their street cars, the crossings shall be made and kept in repair at the joint expense of the companies owning the tracks, and all such cars used on said street railroads shall come to a full stop, not nearer than 10 feet nor farther than 50 feet from the crossing, and shall not cross until the way is clear; and when two or more cars approach the crossing at the same time the car or cars on the road first built shall have precedence.

Sec. 2. That whenever the tracks of any street railroads in this state cross the tracks of any steam railway at grade, the street railway company operating said line of cars shall cause their street-cars to come to a full stop not nearer than 10 feet nor farther than 50 feet from the crossing, and before proceeding to cross said steam railway tracks, shall cause some person in their employ to go ahead of said car or cars and ascertain if the way is clear and free from danger for the passage of said street-cars, and said street railroad cars shall not proceed to cross until signaled so to do by such person so employed as aforesaid, or said way is clear for their passage over said tracks.

Sec. 3. Every person in charge of any street-car or cars who wilfully fails to comply with the provisions of this act, and fails to bring said car or cars which he has in charge to a full stop, or causes the same before the way is clear, or signaled so to do to cross said steam railroad tracks, shall be personally liable to any person injured by reason of such failure as aforesaid, to a penalty of \$100, to be recovered by civil action at the suit of the state of Ohio, in the court of common pleas of any county wherein such crossing or connection is, and the company in whose employ such person having charge of said car or cars is, as well as the person himself, shall be liable in damages to any person or persons injured in person or property (having charge of such car or cars) as aforesaid.

The attorney-general of Ohio, on December 1, rendered an opinion at the request of one of the railroad commissioners, in which he held that the "interlocking" statute of 1896 applies only to interurban street railways and not to city street railways. Also, that under an act of 1891 the railroad commissioners may regulate the overhead work at city crossings independent of any interlocking device connected therewith.

#### INDIANA.

While the law in Indiana prior to 1897 was as stated in the opinion of the supreme court, of which an abstract was given in the "Review" for October, 1897, in that year the legislature passed a law for the protection of grade crossings. The essential parts of this law are as follows:

Sec. 1. Be it enacted by the General Assembly of the State of Indiana, that where it becomes necessary for the track of one railroad company to cross the track of another railroad company, unless the matter of making such crossings shall be agreed to between such companies, it shall be the duty of the circuit court of the county wherein such crossing is located, or the judge thereof in vacation, to ascertain and define by its decree the mode of such crossing which will inflict the least practicable injury upon the rights of the company owning the road which is intended to be crossed; and if, in the judgment of such court, it is reasonable and practicable to avoid a grade crossing, it shall, by its process, prevent a crossing at grade.

Sec. 2. That when in case two or more railroads, or a railroad and an electric road crossing each other at a common grade, or any railroad crossing a stream by any swing or draw-bridge, shall, by a system of interlocking, or by other works or fixtures to be erected by them, or



either of them, render it safe for engines or trains to pass over such crossing or bridge without stopping, and such system of interlocking works or fixtures shall first be approved by the Auditor of State, and the plan of such interlocking works or fixtures for such crossing or bridge designating the place of crossing shall have been filed with said Auditor then and in that case it is hereby made lawful for the engines and trains of such railroad or railroads to pass over such crossing or bridge without stopping, any law or the provisions of any law now in force to the contrary notwithstanding, provided, that the said Auditor shall have and is hereby given power in case such interlocking system or other fixtures shall in his judgment prove to be unsafe or impracticable, to order the same discontinued, opportunity first being given to the person or company operating the same to be heard before said Auditor as to the propriety of such order. In case such order is made and enforced, the existing statutes relative to stopping at crossings shall apply until such time as a device approved by said Auditor is substituted.

Sec. 3. That in case where the tracks of two or more railroads, or the tracks of a railroad and an electric railroad cross each other at a common grade in this state, any company owning any one of such tracks, whose managers may desire to unite with others in protecting such crossing with interlocking or other safety devices, and shall be unable to agree with such others on the matter, may file with the said Auditor a petition stating the facts of the situation, and asking said Auditor to order such crossing to be protected by interlocking or other safety devices; said petition shall be accompanied by a plan showing the location of all tracks and switches, and upon the filing thereof, notice shall be given to each company or persons owning or operating any track involved in such crossing, and the said Auditor shall thereupon view the site of such crossing, and shall, as soon as practicable, appoint a time and place for the hearing of such petition. At the time and place named for hearing, unless the hearing is for good cause continued, said Auditor shall proceed to try the question of whether or not the crossing shall be protected by interlocking or other safety devices, and shall give all companies and parties interested an opportunity to be fully heard; and after such hearing said Auditor shall enter an order upon a record book or docket, to be kept for that purpose, granting or denying such petition; and in case the same is granted, such order shall prescribe the interlocking or other safety devices for such crossing and all other matters which may be deemed proper to the efficient protection of such crossing, and in such order the Auditor shall designate the proportion of the cost of construction of such plant, and the expense of maintaining and operating the same, which each of the companies or persons concerned shall pay, and shall also fix the time within which such appliance shall be put in, such time, however, not to exceed ninety days from the making of such order.

Sec. 4. In case, however, one railroad company or an electric railroad company, shall hereafter cross at grade with its track or tracks, the track or tracks of another railroad, the railroad company or the electric railroad company seeking to cross at grade shall be compelled to interlock such crossings to the satisfaction of the said Auditor, and to pay all costs of such appliances, together with the expense of putting them in and the future maintenance and operation thereof; provided, this act shall not apply to crossings of side tracks only.

The remaining six provisions of the act require: (1) That the provisions of Secs. 2 and 3 being complied with trains shall not be required to stop at any protected grade crossing; (2) refusal or neglect to comply with the law shall be punished by a fine of \$500 per week for each week of such refusal or neglect; (3) the Auditor may, if he deems it advisable, employ a civil engineer to examine and report upon plans for interlocking, and the engineer "shall be allowed such reasonable sum as the Auditor may award;" (4) all laws inconsistent with this act are repealed and this act shall take effect immediately after its passage.

#### CANADA AND MEXICO.

In reply to an inquiry addressed to a railway company in Canada the following was received: "The law is supposed to be the law of common sense administered by the railway committee, and regulations vary according to seniority of franchise, changes of grades, circumstances, etc." This is an admirable statement of what a good law should be. The railway committee of the privy council of Canada is the one referred to, and this body decides on each individual case, the municipal councils having no authority in the premises; after argument by the parties interested the decision of the committee is final.

In Vancouver the crossings were made in virtue of private agreements between the street railway and the Canadian Pacific.

In Mexico City the construction and operating of railroads, street railways included, are only governed by the regulations issued by the Secretary of Communications and Public Works, and the city council has only to attend and supervise what relates to the location of the tracks in the streets, maintenance of pavements, etc. The regulations from the Secretary of Communications provide that all crossings of other railways' tracks shall be constructed and

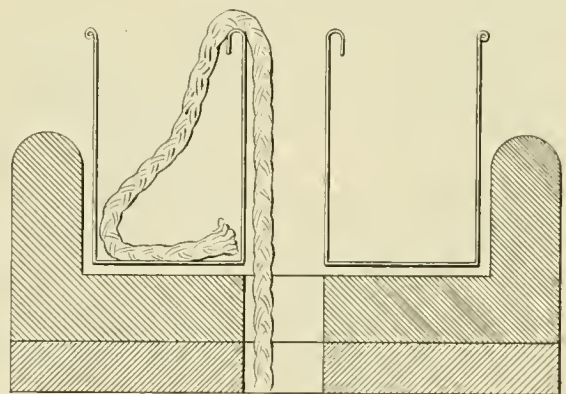
maintained in perfect order at the expense of the company crossing the established track, but under this condition all railways are bound to allow their tracks to be crossed by other lines, the establishment of which have been duly authorized.

In reference to crossing tracks of steam roads, such crossings, outside the city, have to be established over or under the existing track, always submitting to the approval of the Secretary of Communications the project of all of the works connected with the crossing. Only on account of special local circumstances or in very exceptional cases, the appreciation of which corresponds to the Secretary of Communications, grade crossings may be permitted, and these also shall be constructed entirely in conformity with the projects approved by the Secretary of Communications. The company which crosses other tracks has to maintain, at its own expense, a flagman at each crossing, both day and night. The pay of these men is 88 cents per day. This refers only to crossing of steam roads, or of steam and mule tracks. When both are mule tracks no flagmen are required.

Where grade crossings with steam roads are prohibited the entire expense for viaducts or tunnels falls upon the street railway which crosses the established track. Such viaducts or tunnels are for the exclusive use of the railway which constructs them, and only by express consent of the company can they be opened to the general public.

#### WICK FEED OIL CUP.

An oil cup for motors which was adopted by the Metropolitan West Side Elevated Railroad of this city soon after it commenced operation, and which has since been adopted by the Lake Street Elevated also, is shown in principle in the accompanying sketch. The cups on the motor were originally designed for grease and the present cup was designed to enable oil to be used. It is simply a tin cup made



WICK FEED OIL CUP.

to fit in the grease cup and having an opening or tube up through the center. For feeding the oil a wick is put in the cup and one end of it allowed to hang over into the inner tube so that it touches the shaft. The lip or edge of the inner tube where the wick goes over must be made rounding; if it is left sharp it will stop the feeding of the oil through the wick.

The Atlanta Consolidated Street Railway has equipped some 30 of its cars with fenders.

AN ELECTRIC BRAKE FOR STREET CARS.

Electro-magnetic brakes of many different designs have been tried on street cars, but few have stood the test of actual service. The cars of the Ogden City Street Railway Company have been equipped for three years with the Skinner-Dorland electric brake, herewith illustrated.

The brake magnet proper is of the coil and plunger type, with a clutch to hold the brakes set after they have been ap-

plied through a variable resistance and draws the plunger into it with a pull according to the current passing through the coil, setting the brakes at any desired tension. The coils J are then cut out, which allows the spring R to press down the lever J, and clamps the shoe S against the plunger B. The coil C is cut out of the circuit and the brakes remain set until the coils J are again energized.

Several claims characteristic to this brake are made. It is simple in construction, not liable to get out of order, and easily repaired. It does not entirely depend on the current from the line to stop the car, for by moving the switch lever to the emergency stop the car motors are connected as generators. It can be attached to any style of car and connected to the ordinary brakes in use, and works in conjunction with hand brakes without interfering with them. The brake is very quick in action. Very little current is required and that only for a moment, when the brake is being set, then the current can be turned off and the brake will remain set.

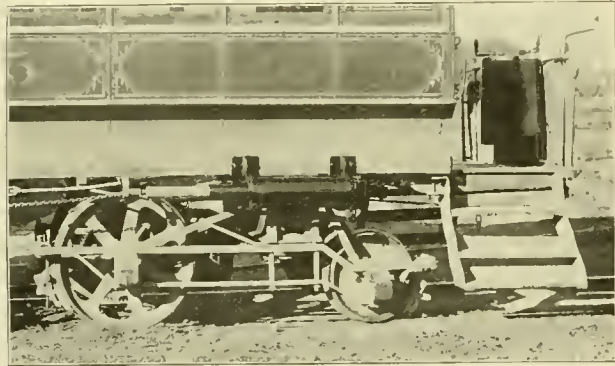


FIG. 4.—SKINNER-DORLAND BRAKE.

plied. Fig. 1 is an end view and Fig. 2 a longitudinal section. In Fig. 2, C represents the coil of wire which when energized draws the plunger B, setting the brake. The clutch is composed of the shoe S, the lever L, and the spring R. The small coils J, and the plungers P, attached to the lever, are designed to operate the clutch by clamping the shoe against the plunger B. The chain at the outer end of the large plunger is connected directly to the brake levers.

Fig. 3 shows the controller switch with the case removed, and its appearance on the car may be noted in Fig. 4. When the switch is turned to the first point the coils J become a part of the circuit and they draw the lever L to the position shown by the dotted lines, which will allow the shoe S to drop away from the plunger, leaving it free to move. At the next turn of the switch the coil C is thrown into the cir-

PORTER ON SEATS.

Robert P. Porter, in his Topics of the Present Time, writes in the New York Herald a few lines on the seat question, a problem which has always caused the newspapers more real suffering than the people who do the standing. He says:

I note the following headlines in a telegram from Albany: "No Seat; No Passengers."

The article briefly states that an endeavor will be made to pass an amendment to the railroad law limiting the number of passengers that may be carried on the cars of the street surface railroads. If this law was passed, in my opinion it would lead to something akin to an insurrection, not only in New York City, but in every city of the state. The trouble in New York City is not the lack of cars during the busy time in the evening, for they are kept running at a few seconds' headway and just far enough apart so that they will not smash into one another. To enforce a law of this sort the street cars would have to do exactly what they do in Paris, which would be an interesting proceeding, especially on bitterly cold nights, or when it is raining and hundreds

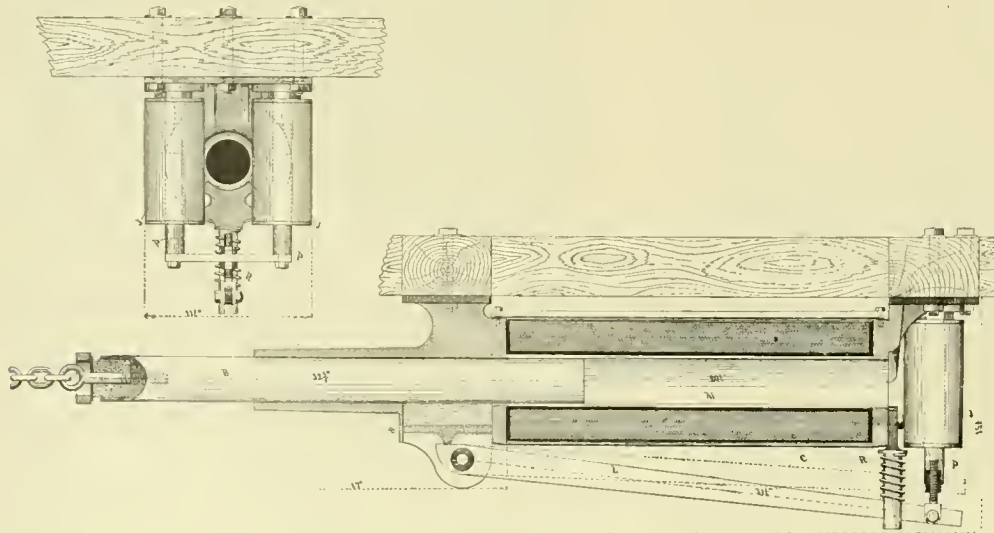


FIG. 1.—FIG. 2.—SKINNER-DORLAND ELECTRIC BRAKE.

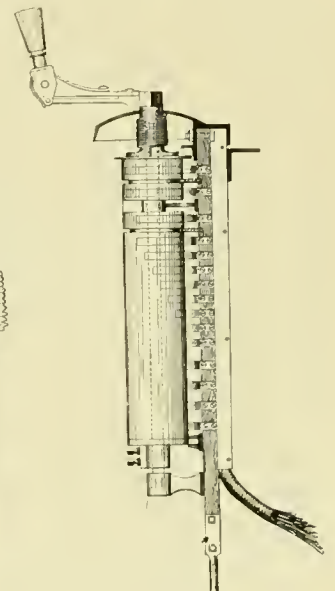


FIG. 3.



of people are anxious to get home. The car stops at a corner and the conductor then hands out to each one of the crowd clamoring for admission a large pasteboard ticket with a number on it. When the passengers have alighted, the conductor calls out a number, much as the head barber in some barber shops where the number system prevails, and one by one the persons owning the lucky number push their way through the crowd and get into the car. Then when all seats are filled, the car moves on, leaving the growling, howling mob at the corner. Last summer when in Paris I watched the process carefully, at one time standing on the street corner for nearly three-quarters of an hour. I discovered that it was not unusual for passengers to wait 20 and 25 minutes before they could secure a seat by this system. The American passenger is simply not built that way. He will not wait, because he wants to get home. If passengers were willing to wait on the average this length of time there would be little or no crowding in any of our cities. Saturday, in coming from Philadelphia, I was waiting to take the new electric Madison avenue car. One came up crowded with people hanging on the platform. I decided to wait one car. The next car contained about 15 people. At 42nd street the car with plenty of vacant seats caught up with the car overflowing with people, and we continued about 20 seconds behind that car until I reached home, less than a quarter of a minute later than those who preferred to hang on to the straps of the crowded car. When you can change the characteristics of a people so that they think nothing of waiting 15 or 20 minutes, or even half an hour, such legislation as here suggested will be practical, but not before.

## DOWN-TOWN TERMINAL IN DENVER.

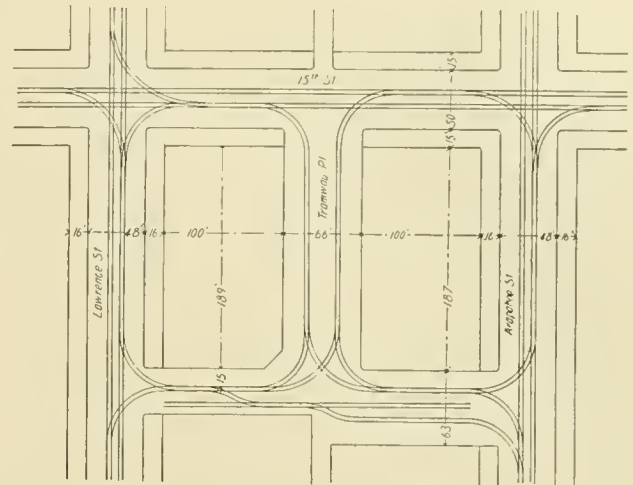
The Denver Consolidated Tramway Company in October last completed its new down-town "turn around," which is undoubtedly one of the most complete street railway terminals in the west. It comprises two loops, connected to each other, providing for the convenient transfer of cars from one loop to the other. Two sidings are provided, one for disabled cars and one for extra cars and line car, etc. These loops are located in the business center of the city, in the block bounded by Arapahoe, Lawrence, 14th and 15th streets. The Post Office, City Hall, Chamber of Commerce, and Mining Exchange are all within one block.

The alley was widened into a 66-ft. street (designated "Tramway Place"), through which the cars on both loops enter from 15th street. Here transfer to and from all the company's lines is made under cover. The upper or Arapahoe street loop is used to turn the cars on the southern and eastern divisions, comprising the following lines: Twenty-second avenue, Stout street, Riverside Cemetery and Stock Yards, 19th and 25th avenue, Colfax avenue, 11th avenue, Broadway and South Broadway, South Tremont street, University Park, Pearl street, Harman and Arlington Park.

The lower or Lawrence street loop is used by the following lines: Lawrence street, east and west divisions, Agate avenue, Ashland avenue, Elitch Gardens and Berkeley, Rocky Mountain Lake, Union Depot.

There is 1,580 ft. of curved track in the two loops and their connections. All the curves have spiral approaches. The construction is of the very best character, girder T-rails weighing 72 lbs. per yd. being used exclusively. The ties, placed 24 in., center to center, are tamarack, creosoted

with 10 lbs. of oil to the cu. ft. by the Michigan Pipe Company of Bay City, Mich. Tie bars are placed at intervals of 6 ft. Brown-Edison plastic bands are used throughout. The



TERMINAL LOOPS, DENVER.

pavement is basalt (granite) blocks and asphalt. All of the curves, switches, frogs and special work, which is of a most substantial character, were built by the company in its own shops.

The detail plans and general construction were superintended by the company's constructing engineer, John A. Beeler, to whom we are indebted for the accompanying plan of the loop.

## MCLEAN RETURNS TO THE UNITED STATES.

Thomas H. McLean, who for the past two years has been president and general manager of the lines in the City of Mexico, has accepted the offer of the Toledo Traction Company, and will return to the United States about the first of April to become general manager of that road. Mr. McLean is recognized as one of the brightest and most successful managers in the fraternity, and has made a record at Mexico which is at once highly creditable to himself and satisfactory to his road. He has introduced American methods, reduced expenses, increased dividends, and his Mexican friends and company part with him with much regret. One of the reasons which has decided him to give up his office there is that owing to the altitude, Mrs. McLean was unable to remain there, although the attempt was made five times.



T. H. MCLEAN.

His many friends will be pleased to welcome his return, and both he, and President Lang of the Toledo Traction Company, are to be congratulated.

At the trial of a personal injury case in Brooklyn the plaintiff was stripped and examined in the court room.

## IMPROVED DEVICES AND METHODS FOR THE SAFE OPERATION OF CARS ON INTERURBAN AND CITY LINES.

(Continued from January.)

Road No. 10: This road operates an interurban line a trifle over nine miles long, all of it being single track, and at both termini uses tracks jointly with local companies; at one terminus the length of track so used by two companies is  $2\frac{3}{4}$  miles, and at the other,  $\frac{1}{2}$  mile. Traffic over the road is regulated by a time table and code of rules, the telephone being used for special orders in cases of delay. The half-mile section mentioned is operated as a block and traffic controlled by a block signal.

The rules governing the joint use of the longer section ( $2\frac{3}{4}$  miles) by interurban and local trains are in substance as follows: Interurban trains must not arrive at or leave any points designated in the time table ahead of time. In general the rights of local trains are superior to those of the interurban trains, except that the few interurban trains between midnight and 6:30 a. m. have absolute rights to the track; two whose leaving time is about 7 a. m., have equal rights; and on a specified section the interurban trains assume the rights of local trains, the latter following as second sections of the interurbans. When running on the time of a local train, the conductor of the interurban must notify all trains met or passed, in writing, giving the number of the motor car which is following him as a second section. Also, the motorman of an extra train must notify, in writing, the motorman of every train met or passed that his is an "extra."

On the half-mile section operated as a block the signal device consists of an electric bell with crank attachment, and an electric indicator at each end of the block. The bell is connected with and controls the electric indicator at the opposite end of the block section. The indicator displays on its face either the word "Block" or the word "Clear." If when a train arrives at the block the indicator displays the word "Block" it means that the block is occupied by an approaching train and the first cannot proceed until the latter has arrived and the conductor set the indicator at "Clear." When the indicator is at the "Clear" position, the conductor gives five complete turns to the crank, which rings his bell, then he gives five turns more, and if the bell does not again ring it indicates that the indicator at the opposite end is set at "Block," and the car being thus protected may proceed. If the bell does not ring at the end of the first five turns of the crank, or if it does ring at the end of the second five turns, or if the indicator falls to "Block" while the conductor is using the crank, it indicates trouble, and a flagman with the proper signals is sent at least five minutes in advance of the train.

This signal does not protect the rear end of the train, and each train must protect its own rear end when it stops or for any cause is moving at a slower speed than is customary.

In case a car becomes dead while crossing a steam railway's tracks the rule is as follows: "You will immediately notify all passengers to leave the car and proceed to a safe distance from the track of the steam railway. You must then proceed in both directions on the track of the steam railway (the motorman one way and the conductor the other), to a distance of at least  $\frac{1}{4}$  mile, or 10 telegraph poles, and place one torpedo on top of the rail on the engineer's

side. The conductor will then go to some telephone or in some other manner at once notify some authorized agent of the steam railway of the obstruction, and the motorman will return to his car. After the conductor has notified the steam railway, he will notify the proper officer of the company. A supply of torpedoes must always be carried in the motorman's tool box. After the car has been moved from the crossing of the steam road, and the track of the latter is clear, you should remove the torpedoes from the rails of the steam road if they have not been exploded by approaching trains."

The manager of this road writes us that while this system has worked satisfactorily, he has been considering installing a block signal for added security.

Road No. 11: This is an interurban line 23 miles long; it is single track with several sidings and turn-outs. The cars are operated on an hourly schedule, from 12 to 17 round trips being made per day, though as high as 80 have been made in one day. The cars are run by a time table, the meeting points being so arranged that the cars pass at two points on the even hour, and at one point on the half hour. There is a train dispatcher with telephone connections at each meeting point, and when a car gets behind time orders are given by telephone, the car out of schedule reporting at each telephone to the dispatcher who gives the order; this order the conductor enters in a book, which he carries for the purpose, and then repeats back to the dispatcher as a check. At meeting points, when delays occur, the car having the right of track is first located and ordered to pass the car which is out of time at some other point, and then the order is given to the late car.

The code of rules is complete and has been found well adapted to the service, so that a heavy traffic can be handled with safety. The dispatcher gives his orders through the agents at the regular stations or by having the conductors call him up at points where there are telephones but no agents at the regular stations or by having the conductors ber of cars, they are run in sections.

During the three years that the line has been in operation, the system has been found to work satisfactorily and the two or three slight accidents which have occurred have been caused by the employes over-running or forgetting their orders.

Road No. 12: This road operates 13 miles of single track in a district where very thick fogs are of frequent occurrence, and makes use of the telephone to protect the cars against accident. The instructions to motormen are to lie at every turnout until the car to be passed at that point has arrived, or until orders have been received by telephone to proceed. By this means the central office is kept advised as to the location of the cars.

Road No. 13: The superintendent of a western line writes regarding the system in use on his road as follows:

The company operates a line of single track about 8 miles



in length. Suitable turn-outs are provided which enable cars to be operated at 15, 20 and 30 minutes, as required, and which are closed when not in use for points of meeting. These turn-outs are known by numbers, as 2, 5, 8, etc. The track is laid on grades of from 1 to 10 per cent and has many curves. As a rule there is much foggy weather on this division, particularly during the summer months. Double truck vestibule cars are used on this line and are equipped with two powerful lever brakes and double headlights for night service.

No extraordinary precautions are employed to avoid head end collisions by the use of block signals or other automatic device.

The oldest and most experienced men in the company's service are employed on this division. The motormen have unbroken records of from three to six years' service and are regarded as expert men in every sense of the word, both in knowledge of their equipment and skillful handling of their cars. In the writer's judgment this is the first requisite in the operation of single track road.

Complicated rules or directions for running are not necessary or desirable, and therefore but one general rule is made which in effect is as follows:

If for any reason a car is detained and unable to make its appointed turn-out within five minutes of schedule time, it loses all rights on the main line and must give way to all cars going in the opposite direction.

Trailers are not used, owing to heavy grades, but on busy days two, and sometimes three, cars are run in one section. These cars are not permitted to run in closer proximity than 300 ft. All cars followed by another within that distance carry a green flag or light displayed on the corner of the forward vestibule. Cars on turn-outs are not permitted to take the main line when passed by a car carrying colors.

Aside from these precautions no other general rules govern the operation of the road. Therefore the conclusions arrived at in the operation of a single track road of 8 to 10 miles in length are as follows:

1. Good men to operate the cars.
2. A carefully prepared time card.
3. Well located turn-outs for the service required.
4. A general rule regarding the rights of way when detentions occur.

With these principles carefully observed a collision of any kind has never occurred on this division, and while Fate may not always remain equally kind to us, I regard this branch the safest part of the entire system.

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Road No. 14: On our single track the precaution against head collisions is that the cars are scheduled to reach a certain point at a specified time. If one car is off time more than five minutes it must wait at the switch for the other car. For instance one car, north bound would reach a given switch on its scheduled time, there it would wait five minutes for the south-bound car scheduled to be at the switch at the same time as the first arrived, then it would leave. In the meantime the south-bound car being five minutes behind time would wait at the other switch until the arrival of the car which was on time. This is the best arrangement that we have been able to determine upon and would greatly appreciate anything which would tend to decrease the danger of collisions, either front or rear end.

Road No. 15: The superintendent of this road, which operates more than 40 miles of suburban lines, all single track, says: My rules are that all cars shall wait on turn-outs a stated time for cars due from the opposite direction, and all cars that cannot reach turn-outs within the same specified time must wait on the preceding turn-out. In case of cars being off time, as an extra precaution, we oblige all conductors to go ahead of their cars on curves where they cannot see for 500 ft. ahead, and in the evening all conductors carry red lanterns with them on the cars, and these are used in case of the failure of the power, or in running ahead on curves, as a danger signal. The speed on our lines is from 12 to 14 miles per hour.

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Road No. 16: Two single track interurban lines, one 12 miles and one 6 miles long, are operated by means of the telephone. The general orders are that no car is to leave a meeting point until the other has arrived, unless specially ordered to do so. There are telephones at all the turn-outs and also at intermediate points, so that an accident is at once known at the office, and the movements of the cars can be regulated by telephone.

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Road No. 17: In regard to rear end collisions during the daytime on account of fog, I have to say that the only remedy I know of is careful attention and good judgment on the part of motormen, and a slower speed than usual during the foggy period. In addition a tail light with a red lens, attached to the outside rear end of each car, is the best mechanical device I know of to prevent rear end collisions. These tail lamps can be obtained of "Smith of New York." One lamp with two bracket sockets is all that is needed to equip a car, and the cost per car is about \$3. In case the power is off and the car is left in darkness these lamps (with one red and one white lens) are always reliable. We think this is a good way to avoid accidents of this sort, and have equipped our road with the rear signal light.

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Road No. 18: We use on our line—nine miles of single track with turn-outs—the block system. A small wire connects lamps placed at each turn-out and when a car enters a block the fact is made known at the next turn-out, by the lamp there being thrown in circuit. By this means a collision is made impossible unless the operators are seeking one. We consider the system a great success.

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Road No. 19: We operate a single track line 15 miles long, on which we give a 30 minute service, by the telephone. We have telephones at each terminus, at each switch, at the power house, at railroad crossings, etc., so that while the road is thus divided into blocks the cars are handled almost entirely by telephone orders. The system is—in my judgment—comparatively safe.

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Road No. 20: With a view to preventing head collisions we have equipped our road with a private telephone line. The instruments are located at the ends of the lines and at all sidings. They are placed in galvanized iron boxes such as are used in some cities for police telephone. These boxes are locked. Each motorman and conductor has his key.

The conductor on a car arriving at a terminal behind time is required to telephone to the dispatcher his time of arrival. The conductor on any car leaving the terminal behind time

is required to telephone to the office his time of leaving. The conductor on a car arriving at a siding ahead of time, or arriving at a siding on time and not finding the car there which he should meet, is required to telephone the facts to the office and take orders. We have one junction point where the cars pass going in opposite directions at such times that they do not actually meet or see each other; at this point there is a sheet placed in the telephone booth on which the east-bound conductors are required to register their initials and time of passing the junction. West-bound conductors are required to enter this booth and ascertain if the car has passed. If so they punch opposite the signature which the conductor has just made. If the west-bound conductor should arrive at the junction and not find the signature and leaving time of the east-bound conductor, he is required to telephone to the office and take orders.

We have found this method very reliable and are well satisfied with it. Will say that of course the conductors are required to follow instructions with regard to telephoning implicitly. Any neglect to do so of course receives prompt

plow. The length is 16 ft., the width 6 ft., and the stationary shear rises to the level of the window sill nearly 6 ft. from the track. This unusual size and weight was designed to meet the excessive snow fall of the east, and the whole plow was built strong enough to withstand the heaviest usage in deep, hard drifts, the shear being carried in very strong guides. The lower edge of the blade is rounded in such a way as to make the plow hug the track. An extra shear of  $\frac{1}{2}$ -in. plate is put upon the forward edge of the plow at the point so as to widen the portion of the track cleaned, and heavy wings and scrapers of unusual length are provided so as to throw light snow far enough away to prevent it from falling on the rails.

The motive power consists of two G. E. 1,000 motors. There are two sand boxes and the usual conveniences within the house. The shears are raised and lowered by means of a hand wheel operating a worm gear. The diggers and scrapers are raised and lowered with a lever. The plow is mounted on 33-in. wheels. The bay window ends have stationary sash except in the centre section where the sash



BRILL SNOW PLOW FOR THE PORTLAND RAILROAD

attention at the office. In the event of the telephone line being out of order, which very rarely happens, our men are instructed to run with the utmost care and to look out for cars everywhere, not to leave sidings ahead of time, and in short to use every possible precaution to avoid accident.

(To be continued.)

### HEAVY SNOW PLOW FOR MAINE.

An interesting form of nose plow built for the Portland (Me.) Railroad, by the J. G. Brill Company, of Philadelphia, is shown in the accompanying illustration. It is of the largest and heaviest type made for a street railway. The box or car is entirely enclosed and is mounted on a very heavy floor frame, to which jaws are bolted for carrying the boxes. The side sills and end timbers are 4x12 in. A double set of end timbers were used in this plow in addition to heavy diagonals. The side sills are continuous from the point of the

drops. The side door slides. Taken all together this is one of the heaviest shear plows that has been built for a street railroad.

### RAILWAY PROGRESS IN GERMANY.

The trolley car is being received with greater favor in German cities as each year goes by and the past one has been a record breaker in the introduction of electric traction. In 1891 but three cities had electric cars, two more were added the following year; in 1893 there were 11; in 1894, 20; in 1895, 32; in 1896, 44, and at the close of 1897 no less than 64 cities enjoyed the blessings of the trolley car. The length of track increased from 533 to 842 miles of single track, and the motor cars from 1,571 to 2,255. The trailers number 1,601. The total capacity of the power stations is 24,920 k. w. New systems are now building in 26 cities, and extensions in 30 others.



**GOVERNMENT OWNERSHIP AND OPERATION OF RAILROADS.**

E. P. Ripley, president of the Santa Fé Railway, has recently written two open letters in reply to attacks made by one of the uneasy advocates of the government ownership and operation of railroads, Mr. Davis of Kansas. The second letter of Mr. Ripley takes up the charge that the railroads are operated with a reckless disregard for human life (this was urged as a reason for government ownership), and after disposing of that the writer gives his reasons for opposing government ownership. The whole of the letter is very interesting, and some portions particularly so to street railway men, because the arguments are sound and their application not confined to the steam railroad field. They apply to the municipal ownership and operation of street railways. Mr. Ripley says:

"In approaching the subject of government ownership, let me say at first, that to me, as a railway officer, and to all railway officers, as such, the matter is one of indifference. If the government owned the railways it would need men to operate them, and I should be entirely willing to take my chances of holding my present—or some other equally good—position. As a railway officer I have no prejudices on the subject.

"Nor, on the other hand, are railway owners—the holders of stocks and bonds—opposed to it. The strongest plea that has been made in behalf of government ownership was made by T. B. Blackstone, president of the Chicago & Alton, and the ground on which he urged it was, justice to the railway investor. There is no holder of railway securities who does not believe that those securities would be advanced in value if there was any prospect of the government buying them, because they are at present below their intrinsic value. So, when any man argues in favor of government ownership, let him not suppose that he is arguing against the interests of existing companies or against the interests of railway stockholders and bondholders. If I am opposed to government ownership of the railways, it is not as a railway man, but on quite other grounds, as a citizen; and I will endeavor briefly to state those grounds, though the question is a large one."

Mr. Ripley's reasons for opposing government ownership are discussed under four heads: 1. There is a grave doubt as to the legal right of the federal government to acquire and operate railroads.

2. The cost of so doing would be enormous and there would be the interest charges to meet. On this point we quote a few words as to what may be expected in the conduct of the business: "It is easy to talk of the government giving better service, employing more men, lowering rates and still making money. As a matter of fact government operation or management of anything never was, will be or can be, as economical as private management; and to earn that interest the government would have to do one of three things: (a) increase the rates—very probably to the level of the rates on the government-owned lines of Australia—which would not be pleasant for the people; (b) cheapen the service, employ fewer men and let things generally get into disrepair, which is what was done on the government-owned lines of Italy, and would be still more unpleasant for the people, or (c) face an annual deficit and rely on taxation to make up the deficit—as has been done on the govern-

ment-owned lines in India—which would be most unpleasant of all."

3. The political considerations are cited as the most serious ones, and they would be of the same serious character were the municipalities to operate street railways. These considerations are thus stated: "There are about 850,000 railway employes in the United States. Under government ownership each of these would be a political appointee. It is certain that the application of politics to the railway service would lower the character of the service, but still more appalling is the tremendous political supremacy which those 850,000 offices would give to the party in power. In Kansas there would be about 26,000 officeholders more than there are now to support the administration.

"Worse still would be the political results of the contracts for construction of new lines, etc. The scandals and the jobbery of the river and harbor appropriations or of the tariff bill would be nothing compared to the field which would be opened to the spoilsmen by the railways. If two towns in Kansas wanted a new railway built, their getting it would depend entirely on the political 'pull' of their representatives at Washington. Districts or states of a political complexion opposed to that of the party in power would have to wait till the crack of doom for any new lines; and in districts where the friends of the administration came from there would be lines as thick as stripes on a cat's back. If there were nothing else to be said against government ownership, the political argument alone would be enough to condemn it forever—or at least until our politics and government were run on entirely different principles from what they are now or until the American people was converted into a race of angels, but there is much more to be said, as we shall see."


4. In conclusion quotations are made from various authorities showing that the government operation of railroads has been, where tried, more extravagant and less efficient than the operation by private companies.

**WORKMAN'S PASS.**

The accompanying illustration shows the form of workman's pass used on the Calumet Electric Street Railway, Chicago. In speaking of the ticket, General Manager Sloan

The Calumet Electric Street Railway COMPANY. <b>WORKMAN'S PASS.</b> No. 87419 GOOD ON ANY LINE FOR THE DATE PUNCHED.																July.	Jan.
																Aug.	Feb.
																Sept.	Mar.
																Oct.	April
																Nov.	May.
																Dec.	June
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	*		

states that it is a great relief from the annoyance of furnishing temporary workmen with transportation, and that it reduces very much the chances of misuse of such transportation offered by ordinary methods.



# THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

The Journal of Electricity for December describes a home-made oil filtering plant provided by G. J. Johnson, engineer of the Electric Improvement Company, San Jose, Cal. The plant, 1,000 h. p., used 8 gals. of lubricating oil per day before the filters were put in; afterwards  $7\frac{1}{2}$  gals. per month were sufficient. The oil is collected in drip pans and, together with what can be wrung from used waste by passing it through an ordinary clothes-wringer, is run into a receiver consisting of an oil barrel with a gage glass in the side. This serves as a settling tank, and the oil is led from the upper part of it to what is called the "filter," and then to the "refiner." The filter is a tank provided with a series of strainers of varying degrees of fineness, and the refiner differs only in having strainers of finer mesh, such as flannel or other woolen fabrics. In both of the filters the oil is washed by passing it through water. The cost of the outfit did not exceed \$25, and has effected a saving of nearly \$50 per month since its installation.

\* \* \*

The pond and troughs, for cooling condensing water from the power station of the Calumet Electric Railway, of Chicago, were described in the "Review," September, 1896, and other references have been made to them in these columns. The water supply for this self-cooling condenser has heretofore come from the city mains, and the water bill frequently amounted to \$100 per month. By a new system of drainage this charge will be entirely eliminated during the fall, winter and spring months. All the water from the roofs of the extensive car barns and other buildings about the plant is drained into the pond. At the northwest corner of the plant the electric cars pass into a subway which runs under the Illinois Central tracks. As the contiguous territory was all formerly a morass, a great quantity of water accumulates in the subway. This is collected in a dry-well and lifted to the surface by a centrifugal pump, driven by an old Ray motor. On an average 15,000 gals. of water was pumped out of this well a day into the sewer, but now this is directed into the cooling pond. The pond is provided with an overflow into the sewer. By the new arrangement, recently completed by General Manager Sloan, all the water needed for the boilers and condensers comes from the drainage.

\* \* \*

#### The Heat-Unit Basis.

Regarding the rating of electric power plants on the heat-unit basis, that is, expressing the performance of the station in the kilowatt-hours per 1,000,000 B. T. U. supplied to steam used in the complete plant, proposed by W. S. Aldrich in a paper before the American Society of Mechanical Engineers in June last, the author presents an abstract of the discussion of that paper in a second one before the Society in December. The points brought out in that discussion and in conferences with engineers since the meeting are thus stated:

"That the heat-unit as a basis for such ratings is both rational and scientific. It is, however, not in consequence the most satisfactory standard for use of builders, contractors and practical engineers dealing with this class of motive-power machinery; namely, steam engines and dynamos.

"That great differences of opinion exist as to the proper definition of the heat-unit required for such a standard. There are at least four different heat-units commonly employed.

"That the present extensive and satisfactory use of the heat-unit for steam-pumping installations is as it should be and is all right in that place; but this is no argument for its introduction and use in a similar manner in the rating of steam electric plants.

"That the present way of stating the performance of electric power plants, however unsatisfactory, is easily understood by all parties interested. Chief of these, of course, is the capitalist; he can readily comprehend rating based on the coal bill.

"That the load factor, after all, has not so much to do with the fuel economy of the plant, as such, however much the varying loads may individually affect any of the units of the installation, such as the steam-engine. Therefore, in the large city and suburban steam-power and electric plants now being installed, there is not the necessity for such strict adherence to economic load factors as in the case of plants with smaller units.

"That the watt expresses the activity or rate of the electrical output, in joules per second. In this respect it is analogous to the horse-power rating of mechanical output. Hence, the standard rating should be in kilowatt-hours per 1,000,000 B. T. U. supplied to the steam used in the whole plant.

"That if the heat-unit basis is considered as the proper standard for the steam electric plant, the whole heat supplied to the plant should be as carefully determined, and in the same manner, as now in vogue for similar standard ratings and contract trials for steam-pumping plants.

"That the boiler should be in evidence in all cases in which plant performance is mentioned. In the electric plant it is economy of installation that is desired quite as much as in the case of pumping plants. Why should the boiler performance be urged into consideration in the former case and not in the latter? If it is a good thing to introduce it in either case it would seem proper to do so in both cases.

"That the common rating of performance of pumping plants in foot-pounds per 1,000 lbs. steam would be amply sufficient for all purposes of rating electric plants for which the heat-unit basis is advocated. This seems particularly plausible on account of the small variation in the total heat of one pound of steam for quite a wide range of pressures now used in modern electric plants. Taking the standard temperature of feed water at  $212^{\circ}$  F., exactly 1,000 B.T.U. are required to raise the temperature and evaporate one pound of feed water into steam at 77.3 lbs. per gage (92 lbs.



COST OF POWER FOR ELECTRIC RAILWAYS.  
Output Measured by Wattmeter in Each Case.

STATION.	MONTH.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel per k. w. h.	Price of Fuel per Ton of 2,000 Lbs.	Kind of Fuel
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.	Total.						
1.....	Oct.	1,155,810	.298	.205	.035	.029	.026	.593	3.6	0.8	10.4	2.7	\$2.21	Bituminous.
1.....	Nov.	1,193,584	.305	.196	.032	.027	.031	.591	3.0	0.9	10.6	2.9	2.10	"
2.....	"	129,333	.516	.374	.062	.000	.032	.984	6.84	7.97	6.95	4.18	2.50	"
3.....	"	207,528	.590	.280	.047	.016	.005	.938	4.34	6.03	8.	5.5	2.15	"
4.....	"	286,110	.474	.218	.036	.002	.002	.733	4.2	6.11	.....	4.38	2.16	"
5. Metropolitan Elevated, Chicago.	"	1,554,946	.371	.147	.019	.010	.021	.568	4.0	1.9	5.72	3.48	.....	.....
6.....	"	493,360	1.016	.210	.071	.....	.020	1.317	.....	.....	.....	.....	.....	Oil.
8.....	"	955,168	.440	.231	.086	.....	.083	.840	.....	.....	.....	.....	.....	.....
9.....	"	221,520	.638	.347	.063	.....	.035	1.083	.....	.....	.....	.....	.....	.....
10. Metropolitan Kansas City, Mo., Central Av.	"	324,136	.360	.140	.012	.013	.041	5.66	1.98	1.76	.....	5.78	1.20 to 1.40	Bituminous

abs.) Taking this as suitable for a simple non-condensing engine, we may compare it with that of 150.3 lbs. gage (165 lbs. abs.), in which 1,013.5 B.T.U. are required to raise the temperature from feed water (212° F.) and evaporate it into steam at the given pressure. In this case, therefore, if we adopt 1,000 lbs. steam instead of the 1,000,000 B.T.U., we make an error of only 1.3 per cent. It is claimed that this is within the usual allowable errors of observation and measurements in power-plant tests, and that there is not enough difference to warrant the trouble required to obtain the performance reduced to a B.T.U. standard."

In a table are given the results of four years' progress in the economic performance of steam-power electric plants, as gathered from reports of the Committee on Data of the National Electric Light Association. The watt-hours per lb. of coal are given in the table as follows:

Year.	No. of Stations.	Max.	Min.	Av.
1894.....	65	208	25	91.7
1895.....	24	262	36	128
1896.....	81	237	33	108
1897.....	14	269.5	98.7	156

These are all electric lighting stations; the descriptions of the plants having the maximum records and the minimum records are tabulated in a second table, in which are also given the daily output and the kind of fuel. The daily outputs of the stations having the maximum ratings were from 3,270 to 22,967 kilowatt-hours per day; those for the minimum records from 80 to 2,790 kilowatt-hours.

For the purpose of showing how the street railway plants, reports of the performance of which we have been publishing in the "Review" for some months, compare with the electric light plants given above, the daily output and the watt-hours per lb. of coal have been tabulated for the six stations regarding which the data are sufficiently complete. The outputs and the watt-hours are averages for six months except in case of No. 10, where they are for five months:

Station.	Daily Output k. w. h.	Watt-Hours pr. Lb. Coal.
1.....	35,203	338.8
2.....	4,728	236.3
3.....	5,695	193.2
4.....	8,294	246.6
5.....	54,849	281.0
10.....	10,232	212.2

Being railway stations and running a greater number of hours per day (roughly, at least three times as many hours

at good load) than the lighting stations, it appears that the six plants tabulated should be directly comparable so far as daily output is concerned with the "maximum" plants in the first table. The comparison shows that these six plants are well up as regards the watt-hours per lb. of coal. The Committee on Data in two of its reports cited the performance of the engine at the Chelsea Jute Mills, Brooklyn, showing a coal consumption of 1.482 lbs. per i. h. p. per hour with a load varying from 495 to 765 h. p.; and the performance of the Chestnut Hill (Boston) pumping plant, of an effective pump horse-power on 1.34 lbs. of coal. Were these to be equaled in electric stations the results would be 400 and 557 kilowatt-hours per lb. of coal, respectively.

It is admitted that the tabulations here given do not give all the information that could be desired, but they were made for the purpose of showing how the street railway plants compare with the lighting stations on the same basis as used for the latter in the paper quoted.

\* \* \*

### A Continuous Recording Indicator.

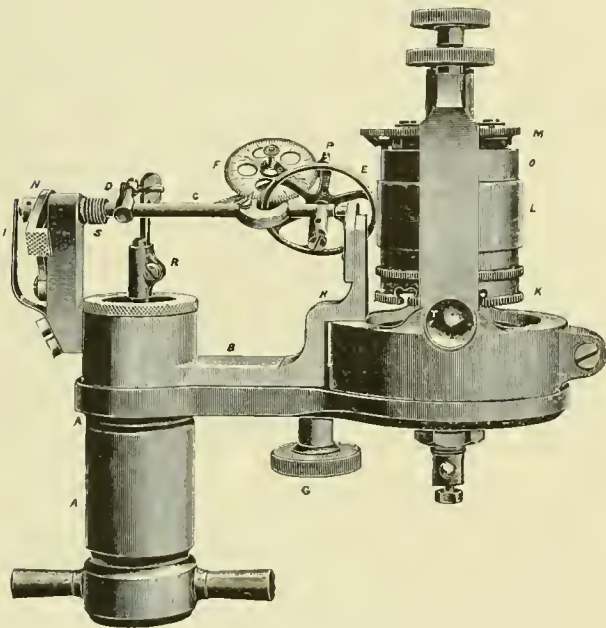
In the operation of street railway power stations there is no difficulty in ascertaining the load upon the electrical machinery at any instant or in securing a record of the total output; this is merely a matter of reading the instruments. But when it is desired to determine the losses between the steam cylinders and the generators, it is necessary to provide a constant load for a considerable time or to attempt to take all the necessary observations at the same instant. The difficulty of providing a constant load in a street railway station is readily appreciated, and second method, that of taking simultaneously indicator diagrams and the instrument readings, is open to the objection that the results will always depend on whether the load at the instant is increasing or decreasing, that is, whether the flywheel is storing up or giving out energy.

A continuous recording steam engine indicator offers just what is desired, a means of recording all the work done in the steam cylinders, as the wattmeter gives the total output of the generators. It is, of course, not meant that there is the same need for an indicator as for a wattmeter in the ordinary operation of the station, but only for the purpose of tests under actual running conditions.

The obstacles to be overcome in the successful design of such an indicator can readily be appreciated, and few of them have proved of any practical value. We reproduce from Engineering, London, the accompanying illustration

and description of an instrument designed by W. G. and C. W. G. Little, of Bexley, Kent, which is simple in principle and construction and, as numerous tests have shown, accurate in its working.

The details of the instrument are as follows: A is the cylinder of the indicator containing the piston and spring, which are of the usual standard type. B is a carriage, sliding on to the upper part of the cylinder, and securely held in position upon the bracket of the instrument by the conical screw G which, on being screwed home, brings the axis of the shaft C into a position to cut the axis of the drum O at right angles. C is a shaft provided with a rigid arm P carrying the counter F and one pivot of the axis of the wheel E, the other end of which is pivoted on the shaft itself. The wheel is dished to allow of the forward bearing H being brought close up to the contact slide L of the drum O, and in line with the shaft C. The counter F consists of two toothed wheels, one of 100 teeth and the other of 99 teeth, both engaging with a worm on the axis of the plani-



LITTLE CONTINUOUS RECORDING INDICATOR.

meter wheel, the upper one being graduated in 100 divisions, a simple and well-known device for recording a large number of revolutions. D is a crank carrying a pin I working in the slot of the crosshead R, which pin is kept in contact with the lower surface of the slot by means of the small spring S. The spring I bears upon the pointed end of the shaft, keeping the wheel in contact with the drum at a fixed pressure. M is a rocker enabling the wheel to be placed in contact with the drum, or not, at will. K is a frame carrying the bearings of the drum O, the latter being provided with a hollow spindle which can be filled with oil for the lubrication of the upper and lower bearings, which are conical centres. The lower part of the frame is split, and fitting accurately over the spring box on the bracket, can be tightened up in any desired position by means of a single screw. The milled head T is a removable stop to the drum O. M is a device for accurately measuring the stroke of the drum while in motion, and which, by means of a vernier, can be read to .005 in. This device consists of

three parts, a center piece attached to the frame, and two rings fitting around it, each being provided with a tooth on the lower side, one ring being graduated, the other carrying a vernier. As the upper edge of the drum is provided with a similar tooth at the same distance from the centre, its contact with those on the rings causes them to set themselves apart by an amount equal to the stroke of the drum and thus to record accurately the amount of its rotation. L is a hard brass sleeve which can be slid up or down, allowing a change of the contact surface if necessary; but as the pressure of the wheel upon the slide is very slight, a great number of revolutions can be made upon one place before the line of contact can be detected even by the finger nail, and the instrument will continue to record accurately for an indefinite length of time.

This instrument is an integrating device, and its theory may be thus explained. The work done in the cylinder in any short interval of time is the product of the total mean pressure on the piston during that time multiplied by the distance the piston moves during the same interval, and is positive or negative according to the direction of the motion of the piston. The drum O being connected to the crosshead by a reducing motion, its motion is the same in direction and proportional in amount to the distance traveled by the piston. The drum O and the wheel E being in contact, it is evident that the rotation of E will depend on angle which its plane makes with the axis of the drum O; the distance traveled by a point on E is the distance traveled by a point on O multiplied by the sine of the angle of inclination of the plane of E to the axis of O. But because of the slotted crosshead R and crank D the sine of this angle of inclination is proportional to the steam pressure in the cylinder, provided the angle equals  $\theta$  when the pressure equals  $\theta$ . The result, therefore, is that the wheel E by its rotation during the forward stroke registers on the counter the work done, and during the exhaust stroke rotates backward an amount proportional to the negative work done by the piston. And the reading of the counter at any time, multiplied by a constant depending on the dimensions of the instrument and of the engine, gives the work done up to that time.

It can also be shown that it is not necessary that the angle of inclination between E and the axis of O be equal to  $\theta$  when the steam pressure is  $\theta$ ; that is, the wheel may be set at any initial angle. In practice this initial angle is made about  $35^\circ$ , which gives sufficient torque on the spindle of the wheel at all working angles, and any slip during the forward stroke is compensated for by the slip during the return stroke.

Tests have shown the instrument to be reliable up to speeds of 450 r. p. m.

\* \* \*

#### The Q & C-Scott Boiler Feeder.

As we have frequently called attention in these columns to the wastefulness of steam pumps for feeding boilers, it is with satisfaction that we place before our readers the description of the Q & C-Scott boiler feeder, which supplies the boiler with water at a lower cost than can be done by the ordinary steam pump, and automatically maintains a constant water level. The economy of the apparatus over a pump is due to two things: 1. It is necessary with it to do absolutely less work to accomplish the same result, that is,



feed the boiler. This is true because the water is introduced into the boiler from the main receiver by gravity, and it is only necessary to lift it to a height slightly above the boiler, instead of pumping into the boiler against boiler pressure.

2. In the vessel in which the steam works when lifting the water all the ordinary losses except radiation, that is, the heat that would be lost because of leaky pistons, clearance, cylinder condensation, etc., is all returned to the feed water. Also, the items of pump repairs, packing and oil are eliminated.

The illustration shows the arrangement of the apparatus when the water is taken from an open heater; it is also arranged for use with a closed heater. The operation is as follows: Water from the heater enters and fills the primary receiver by gravitation, and is then driven to the main receiver by steam pressure admitted to the primary receiver through the differential and pass valves. When the main receiver is in this manner filled, the steam valve at the top rises and admits steam to the surface of the water. The pressure above the water balances the pressure from the boiler upon the check valve in the feed pipe, and the height of the column of water causes it to fall by gravity, discharging into the boiler.

During the time when the main receiver is discharging into the boiler, the primary receiver is refilling, the steam to force the water from this primary receiver being alternately admitted or cut off by the action of the differential valve.

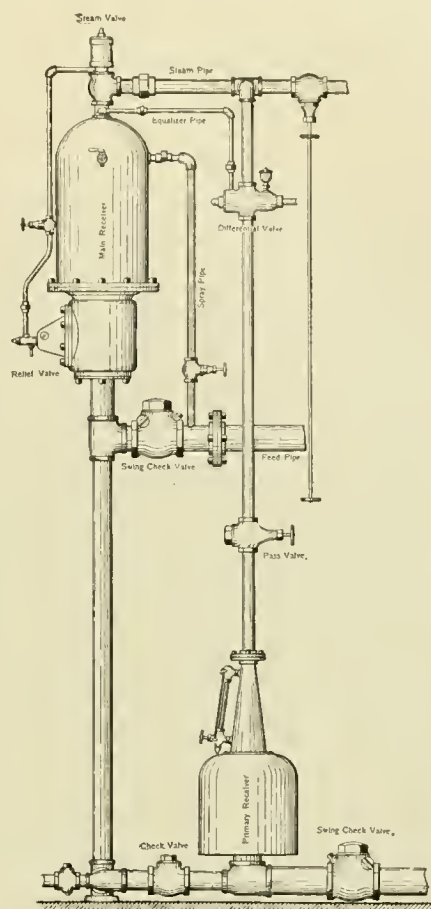
The motions of this valve are governed by variations of the pressure in the main receiver, communicated by the equalizer pipe, in such a way that while the main receiver contains full boiler pressure, the valve is closed, but when pressure in the main receiver is reduced by a few pounds, the valve is opened. When the primary receiver has refilled, it awaits the reduction of pressure in the main receiver, which is needed to open the differential valve.

Assuming the primary receiver to be filled with water and the main receiver to be discharging, the latter will contain full boiler pressure and the differential valve will be closed. The main receiver will continue to discharge until the water recedes to such a level as to allow the float of the relief valve device to fall. This closes the steam valve above and confines a volume of steam equal to the capacity of the receiver above the water level. Natural radiation with its consequent condensation, almost instantly causes a slight reduction of pressure in this receiver below the pressure in the boiler, and this small reduction permits water to be driven back to the main receiver through the spray pipe, which is connected to the boiler feed pipe.

The spray which this returning water forms by impact against a deflecting plate, falls through the steam and causes a much greater reduction of pressure, amounting generally to 30 or 40 lbs. This fall of pressure opens the differential valve and admits live steam to the surface of the water in the primary receiver, and drives the water to the main receiver. As the main receiver fills, its pressure rapidly recovers until it equals that of the boiler. The differential valve then closes, thus allowing the steam in the primary receiver to exhaust and enabling the receiver to refill with water, which condenses whatever steam remains, thereby absorbing all the thermal units therein contained. A repetition of these actions makes the operation of the device continuous. The rapidity of the operation, however, varies with the boiler requirements without attention from anyone. Though usually arranged to make two or three discharges per

minute, a sudden call upon the boilers will cause the appliance to accelerate its speed of action, while a lesser requirement will correspondingly retard it.

It is evident that the only steam exhausted is that used



THE Q & C—SCOTT BOILER FEEDER.

in the primary receiver for lifting the water to the main receiver, and the volume of this steam, at boiler pressure, is equivalent to the volume of water transferred to the main receiver. Comparative tests have been made showing the steam required for this feeder system to be less than 12 per cent of that used by a duplex pump of the size usually provided for boilers of the size tested.

On January 23 the boiler room of the Salem power house of the Lynn & Boston Railroad Company was flooded by the concurrence of an unusually high tide and a heavy downfall of rain. The dynamos were stopped and cars stalled on the local division.

On January 28 a fire in the building adjoining the power house of the West Chicago Street Railroad threatened the former building. A large quantity of oil, which is used for fuel, was stored in the basement, which was flooded as a precaution. The offices of the company are in the building, and the danger appeared so imminent that the books and papers were removed to a place of greater safety. The hose lines carried across the track compelled the abandonment of the down-town loop for several hours during the evening.

### OFFICERS OF THE BOSTON ELEVATED.

At the meeting of the stockholders of the Boston Elevated Railway Company, held on January 3, the following directors were elected for the ensuing year: Frederick Ayer, William A. Bancroft, Samuel Carr, F. Jefferson Coolidge, William Endicott, Jr., William A. Gaston, Charles J. Paine, F. H. Peabody, Robert Winsor, James M. Prendergast and Jacob C. Rogers. A few days later officers were elected as follows: William A. Gaston, president; William A. Bancroft, vice-president; William Hooper, treasurer; John T. Burnett, secretary and clerk of the corporation. C. S. Sergeant, formerly general manager of the West End Company, was elected second vice-president of the Elevated Railway Company, with enhanced duties and emoluments. Prentiss Cummings, formerly vice-president of the West End, is advisory counsel, and J. H. Goodspeed, treasurer of the old company, is comptroller.

It is expected that the company will move its offices from the somewhat cramped and narrow rooms in which a portion of the business of the West End Company has been carried on for over 10 years, to the Converse building, now in process of erection at the corner of Pearl and Milk streets. The company will occupy eight or more stories in the new building and have ample room to provide for all of its office force, which is now scattered through five buildings in various parts of the city.

### STREET RAILWAYS IN PENNSYLVANIA IN 1897.

From the annual report of Major I. B. Brown, superintendent of the Bureau of Railways of Pennsylvania, we take the following data as to the street railways of Pennsylvania for the year ending June 30, 1897:

The capital stock outstanding at that date was \$143,489,309; the funded debt, \$42,812,430, and the current liabilities, \$34,266,976, making the total capitalization \$220,568,715. Of this amount of capital stock and funded indebtedness the street railway corporations themselves own \$52,314,349. It is stated that comparisons between this statement and those of former years are difficult to make and would probably be inaccurate because of the remarkable rapidity with which changes are made in the management, leasing or control of street railways as the result of recent legislation and the introduction of electricity as a motive power. There have been but few consolidations or mergers in law, yet there are a large number of cases where a traction company, as authorized by law, has leased the lines of other companies upon a nominal rental, and the stock of the leased companies, or a large portion of it, has been assigned to the new one, the stockholders taking the stock of the latter company in payment. This is practically a consolidation or merger, and it is said in the report that it would be well for all concerned if the laws were so amended as to permit such consolidation in law as in fact.

The total cost of road is reported at \$100,416,717, and the cost of equipment at \$17,833,297, making the total for road and equipment \$118,250,014. The total mileage is given as 1,551.97. Per mile the cost of road and equipment are, respectively, \$64,703 and \$11,491, a total of \$76,194.

The gross earnings from operations were \$18,879,649; income from other sources, \$8,516,840, or a total income of

\$27,396,489. The receipts have fallen off in a measurable degree from those of the previous year. Major Brown says:

"In all probability the use of the bicycle by business people and pleasure-seekers is the prolific source of the reduction in the receipts of many street railway companies. In cities where favorable conditions do not exist for the use of the bicycle, where the hills are steep and not easy of ascent or descent, the railway companies probably have not been affected by the use of the wheel to so great an extent, but in cities like Harrisburg and many others it cannot be gainsaid that the bicycle has become a most serious competitor of the railway.

"To reinforce this view of the case an observation was made on Third street, Harrisburg, during the month of October, 1897. The observation covered two days from 7 in the morning to 6 in the evening. During that time 6,078 persons passed a given point, 1,962 in the cars and 4,116 on bicycles; 67.7 per cent on bicycles and 32.3 per cent on the cars, or more than two to one in favor of the wheel. To what extent this large number of bicycle riders affected the receipts of the traction company can only be conjectured."

The total of operating expenses is given at \$10,075,644; taxes, \$1,567,335; interest on funded debt, \$1,919,084; rentals, \$7,736,525; other expenses, \$942,481; dividends, \$5,214,874; a total of \$27,455,943.

Reduced to per mile of track the figures for receipts and disbursements are, cents omitted, as follows:

Gross earnings, operations.....	\$12,165
Income, other sources.....	5,488
Total income .....	\$17,653
Operating expenses .....	\$ 6,492
Taxes .....	1,010
Interest on funded debt.....	1,237
Rentals .....	4,985
Other expenses .....	607
Dividends .....	3,360
Total expenditures .....	\$17,691

The report shows that there are in the service of the street railways of Pennsylvania 4,914 motor cars and 499 other cars, or a total of 5,413, and that the number of employes is 12,079, to whom was paid during the year \$6,920,692. The number of passengers carried is shown to be 409,723,418.

During the year there were 18 passengers killed and 510 injured; there were 4 employes killed and 71 injured; of other persons there were 71 killed and 364 injured; total, 93 killed and 954 injured. The statement is made that the hazard to passengers is greater on street railways than on steam railroads, as there were but 36 passengers killed and 782 injured on over 22,000 miles of steam railroads operated within the state. This is correct as to the hazard when the basis chosen for comparison is the number of miles of track operated. Based on the number of passengers carried, the figures are quite different, being as follows: Passengers killed: Street railways, 1 in 22,762,412; steam roads, 1 in 4,281,226. Passengers injured: Street railways, 1 in 789,448; steam roads, 1 in 107,086.

An extra car has been found necessary to accommodate the early morning traffic on the Wilmington (Del.) & New Castle Electric Railway.



## STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

The increase in the membership of the Street Railway Accountants' Association, which was organized less than one year ago, is very gratifying. In March, 1897, the association organized with 25 companies as members; 12 others joined in the interval between that meeting and the Niagara Falls meeting in October, and at the convention 16 more companies were added to the membership. Since then the Brockton Street Railway Company, Brockton, Mass.; the Capital Traction Company, Washington, D. C.; the Detroit Citizens' Railway Company, Detroit, Mich.; the Atlanta Railway Company, Atlanta, Ga.; the St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo.; the United Traction Company, Pittsburg, Pa., the Salt Lake City Railroad Company, Salt Lake City; the New Orleans & Carrollton Railroad Company, New Orleans, and the Hartford Street Railway Company, Hartford, Conn., have also joined. One company, the Cincinnati Street Railway Company, has withdrawn from membership.

The 60 American and Canadian companies which are members of the association operate 3,721 miles of track and 17,414 cars. The total street railway mileage of the United States and Canada in 1897 is given as 16,228 miles, and the total number of cars operated as 52,779. Therefore, the members of the Accountants' Association represent 22.9 per cent of the street railway mileage and 33.0 per cent of the cars of the United States and Canada. No better evidence could be brought to show that the interest in the work of the association is genuine and that its career is certain to be a prosperous one.

The companies which have, so far as we are advised, adopted the standard system of accounting reported by the committee of the association are as follows: Cass Avenue & Fair Grounds Railway Company, St. Louis; Citizens' Railway Company, St. Louis; St. Louis Railroad Company; Lindell Railway Company, St. Louis; Missouri Railroad Company, St. Louis; Union Depot Railroad Company, St. Louis; Twin City Rapid Transit Company, Minneapolis-St. Paul; Cleveland Electric Railway Company, Cleveland; Toledo, Bowling Green & Fremont Railway Company, Toledo; Hamilton Street Railway Company, Hamilton, Ont.; Richmond Traction Company, Richmond, Va.; Akron, Bedford & Cleveland Railroad, Cleveland; Columbia Railway Company, Washington, D. C.; Tonawanda Railroad Company, Tonawanda, N. Y.; Augusta Railway & Electric Company, Augusta, Ga.; Montreal Street Railway Company, Montreal, Can.; Boston Elevated Railway Company, Montreal, Can.; Boston Elevated Railway Company, Boston; Capital Traction Company, Washington, D. C.; Lehigh Traction Company, Hazelton, Pa.

In January, Secretary Brockway addressed inquiries to the members of the association as to the action which they had taken in regard to standard system of accounts. The information which may be elicited will be awaited with great interest by all who wish to see the accounts of street railways placed on a basis that will admit of comparisons of value.

The scene of the hold-up has again shifted; this time it is in Omaha. Two men entered a car on the 13th street line and secured \$25 of the conductor and motorman.

## HIGH WATER AT NIAGARA.

The great storm which swept over the central states on January 21 and 22, doing a great deal of damage in wrecking pole lines by an overload of sleet and snow, made itself felt at the foot of Lake Erie in a terrific gale of wind. The storm blew at a rate of 50 miles an hour steadily out of the west for 48 hours, with a result that mountains of water were forced to the foot of the lake and rose at the docks in Buffalo to the highest point in many years. This volume of



WASHOUTS ON GORGE ROAD.

water naturally caused a rise in the Niagara river, where the water came to a point making it too dangerous to use the foot bridges to the islands, while the Sister islands were partly submerged. The water in the Gorge in places rose 30 ft. above normal and the Maid of the Mist landing and shelter at the foot of the incline were swept away. Serious injury was caused in places to the roadbed of the Gorge road, which, pending repairs, forced the cars to use the incline at the Battery. Our illustration shows one of the washouts in the track, the location of which will be readily recognized by all who were at the Niagara convention.

## WE ALL HAVE OUR TROUBLES.

"A Reader" hands us the following, which indicates some people are not afraid to ask for what they want, whether they deserve to get it or not:

"We have met the champion kicker; he kicked because the conductor asked him for his fare, when he only wanted to go to two blocks, and, the manager being on the car, he thought the conductor should have been instructed to carry him. He got off, but demanded an explanation from the manager when he met him a few days later."

# BOOSTERS FOR STREET RAILWAYS

The adaptation of the booster for street railway service has been of recent origin, and more consideration has been given to the subject this last year than at any previous time. Theoretically the booster is only a subterfuge, for the energy generated is not intended for useful work; the increase in voltage is only to compensate for the drop in the lines. The conditions which call for the booster, have been developed within the past year or two. Many companies have built lines out to pleasure resorts some miles from the city and the center of distribution. Only for a few months in the year is it necessary to make provision for power on such a line. At certain times the traffic will be so heavy as to tax the capacity of the conductor circuit to its utmost limit.

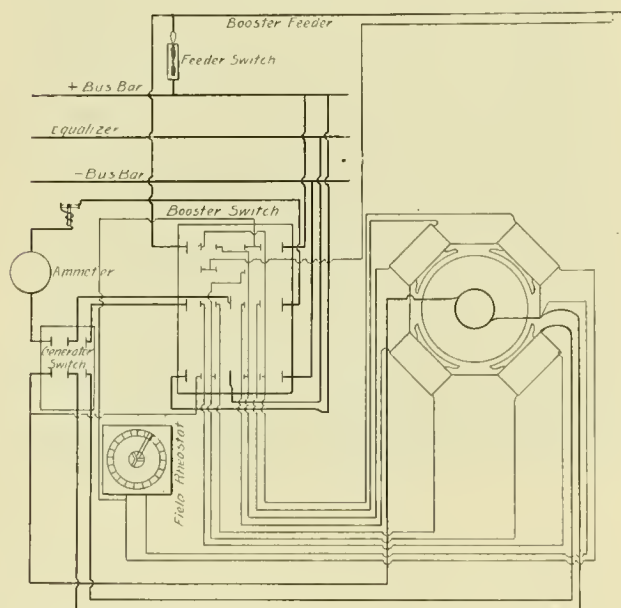


FIG. 1.—CONNECTIONS FOR BOOSTER OR GENERATOR.

The result is a very large drop in voltage, inefficient operation of motors, a slow speed of cars, and an enormous loss of current. The traffic is profitable, but on account of its being intermittent it will not justify large feeders and heavy line construction.

There are other cases where a separate system, with its own power plant, has been absorbed by a large company. The energy output of the small plant is very expensive as compared with that of the central station of the system, but the lines may be so long as to prohibit an economical distribution at 500 volts.

Perhaps the most frequent occasion for a booster installation comes from extensions to existing long lines, such as described by Charles Hewitt in his paper before the last meeting of the A. S. R. A. A line, having heavy traffic, terminated 7.3 miles from the power station. It became necessary to extend the line 3.9 miles farther, and the problem then presented was an economic choice between a sufficient increase in feeder capacity, an auxiliary station, storage bat-

teries and a booster. The estimated cost of the installation was \$52,000 in favor of the booster and battery. An old 300-k. w. dynamo was easily altered to serve for boosting. The generator circuit passed through the booster and the initial potential was raised 150 volts, more or less according to the current demand. By this means compensation was made for the drop in the feeders and the pressure at the battery house, which was located at the end of the line, remained nearly constant.

There is hardly a doubt but that there are many feeder lines which for economic transmission require a voltage above 500. In some cases the voltage at the generator has been raised to 600, but this can not be recommended. The raised voltage should only be where required, that is, on long feeder lines where the drop will reduce it to about the same potential as on the rest of the system. If careful tests were made it would be found that the installation of a booster in many central stations would be economical wherever feeders extend farther than 5 or 7 miles from the generators. In systems, like those in Chicago and Boston, where there is an enormous demand for current, the building of large sub-stations near the centers of distribution is unquestionably the best policy, but these conditions exist only in the largest cities.

One of the first railways to adopt the booster was the Chester Traction Company. In June, 1894, one 100-k. w. and one 150-k. w. Short railway generators were connected up as boosters. The connections, made by J. L. Woodbridge, are such that the machines can be used either as boosters or generators. Fig. 1 shows a diagram of connections for such alteration. A double-throw switch, having seven blades, four for the shunt field circuit, connects the dynamo as a booster when thrown up. However, the feeder switch is open, and the shunt fields are in parallel with each other and the feeder as shown. The machine can be used as a generator again by reversing the switch. The system has been in service ever since its installation on occasions of heavy loads, during Saturdays, Sundays, holidays and the summer months. The boosters, of course, are engine driven and are connected to two lines 7 and 9 miles long, upon which the potential is raised to 900 volts. This plan saved an investment of \$15,000 in copper, and the cost of operation is only a small fraction of the interest on that sum. The boosters have given satisfaction and have proved to be a good investment.

In July, 1895, a booster was started in the power house of the City & Suburban Railway Company, now a part of the Baltimore Consolidated Railway Company. Several of the lines extended 5 to 7 miles out from the station and terminated at summer resorts. On Sundays and warm nights during the four summer months as many as 20 cars are required on each division to handle the traffic, while for ordinary travel two or three are sufficient. Feeder lines were strung sufficient for six or seven cars and the booster was to care for the rest of the load. For this purpose a General Electric 125-volt six-pole lighting generator was installed. The field coils were rewound for series con-



nection and the machine belted to a small engine. The machine is connected up at the switchboard through a panel with an ammeter, voltmeter and circuit breaker on it. On the long distant feeder panels there is an auxiliary bus bar through which any of the feeders can be connected by a double-throw switch to the booster circuit.

The Toledo & Maumee Valley Traction Company and the Toledo, Bowling Green & Fremont Railway Company, two companies under the same management, each has a booster connected to its feeder lines. C. A. Denman, general manager of the two companies, gives the following description: "The Toledo, Bowling Green & Fremont line extends from Bowling Green to Perrysburg, a distance of 13 miles. From Perrysburg the cars run over the line of

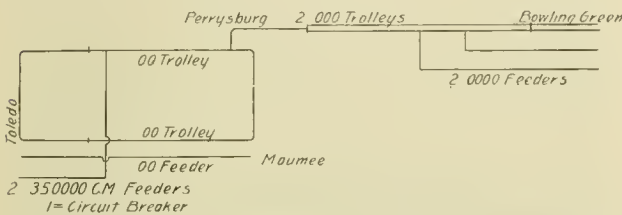


FIG. 2.—FEEDER CONNECTIONS.

the Toledo & Maumee Valley Railway into Toledo. The Toledo & Maumee Valley Railway has a belt line of 23 miles in length, or around, extending up the west side of the river to Maumee, thence across the river to Perrysburg, returning on the east side by way of East Toledo. The Bowling Green road is fed from the Bowling Green power station at the extreme end of the line, and the Toledo & Maumee Valley is fed from the power house of the Toledo Traction Company in Toledo, a distance of 11½ miles from Toledo to Perrysburg.

"Owing to the length and variable travel on these lines, the ordinary method of distribution would not be applicable as the expense for copper would be prohibitive. The booster system is in use on both of these roads. The booster has been in service on the Bowling Green line since the road was built, which is about a year and a half. The Toledo & Maumee Valley Railway has been in operation about three and one-half years, the booster being used here for two and one-half years. Before it was installed it was

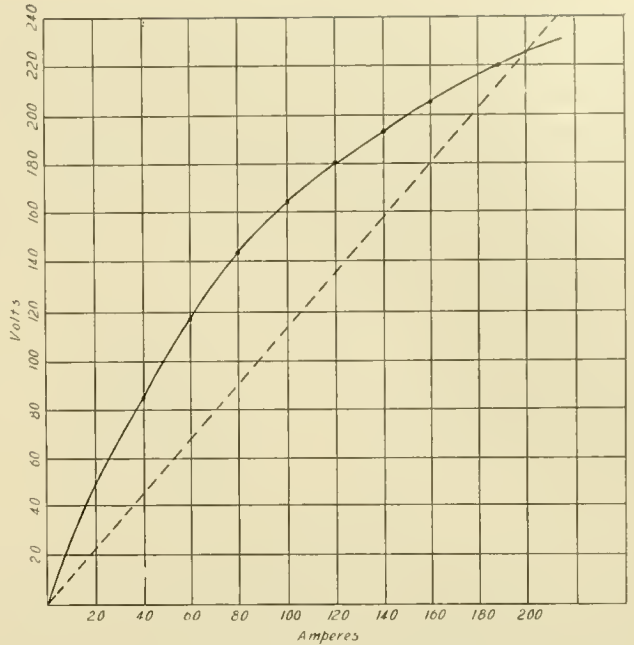


FIG. 3.—BOOSTER CHARACTERISTIC.

impossible to run on a fast schedule on account of the low voltage, but no trouble has been experienced since, however heavy the load. The first four miles of each road is fed direct from the generators and the rest from the booster. A diagram of the feeders is given in Fig. 2. The booster is a series wound machine with its negative brush connected to the positive bus bar, and the positive brush to the feeder; the voltage is thus raised automatically as the load increases, to compensate for the drop in the line. Theoretically, the rise in the voltage ought to be equal to the drop in the line, but such close regulation is not necessary in railroad work. The characteristic of the booster at Bowling Green taken in actual service is given in Fig. 3. It is seen that the voltage rises a little faster than theoretically required for loads under 100 amperes, and a little slower for loads above this, due to the fields approaching saturation. The booster, used at Bowling Green, Fig. 4, is one made by the General Electric Company, and is a 45-k. w. multipolar machine.

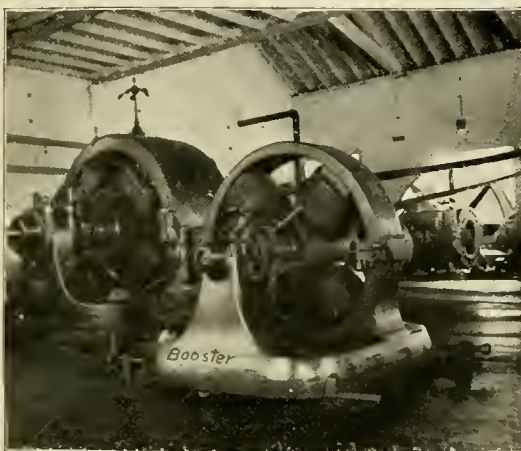


FIG. 4.—BOOSTER AT BOWLING GREEN.

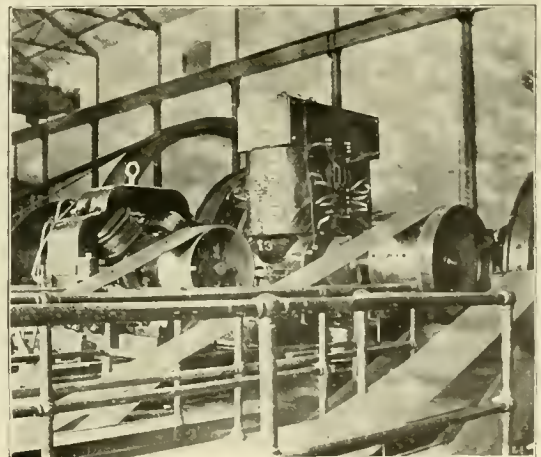


FIG. 5.—TOLEDO & MAUMEE VALLEY BOOSTER.

"The one used at Toledo on the Toledo & Maumee Valley Railway is a 200-k. w. Edison bi-pole railway generator, Fig. 5, rewound for use as a booster. A double-pole, double-throw switch is used in order that the booster may be cut out, and this line fed direct from the generators and still have the current pass through the wattmeter. A diagram of connections is given in Fig. 6. Both machines are engine driven. On several occasions, due to accidents at

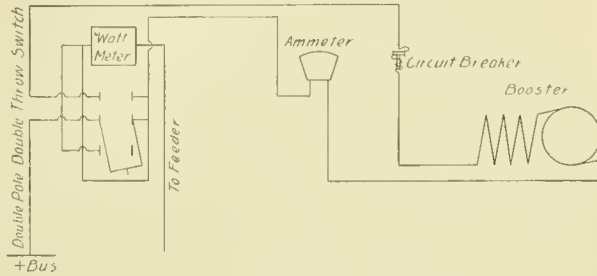


FIG. 6.—SWITCHBOARD CONNECTIONS.

the Bowling Green power house, power has been supplied from Toledo, a distance of 26 miles, and the cars operated, the voltage at Bowling Green being 400 volts with two cars on the line, each loaded with 40 passengers, and a speed of 24 miles an hour has been attained under these conditions. These were double truck cars, 36 ft. over all, equipped with two G. E. 800 motors each. If the question of running cars 26 miles away from the power station at a speed of 24 miles an hour were submitted to most electrical engineers they would say it would be impossible, but before trying the scheme I was confident that I could run cars that distance from the power house for the reason that I have frequently tested the voltage 11½ miles from the power house, and found that I had from 575 to 625 volts, but I was very much surprised to find on looking at the instrument, that I had 400 volts at Bowling Green with power cut in.

"From the Toledo power house we have a 350,000-c. m. cable running 4¾ miles from the power house and tapping into two No. 00 trolley wires running 4½ miles and one No. 00 trolley running 2¼ miles. This is the extreme end

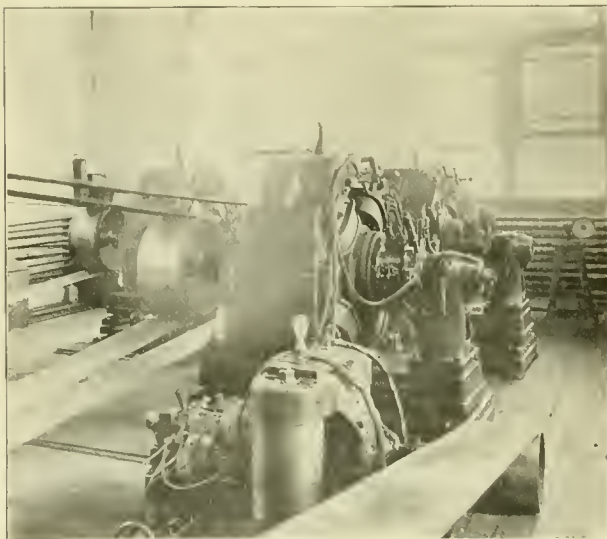


FIG. 7.—T.-H. DYNAMOS USED AS BOOSTERS.

of the Valley circuit wire; it is then attached to the Bowling Green line with a fibre circuit breaker on the Bowling Green line. There are two No. 000 figure 8 trolley wires running the entire distance of the line, 13 miles. Then we have two No. 0000 feed wires, one running 7 miles from the power house, and the other 9 miles. The 7-mile feed wire is tapped into the two trolley wires running to the circuit

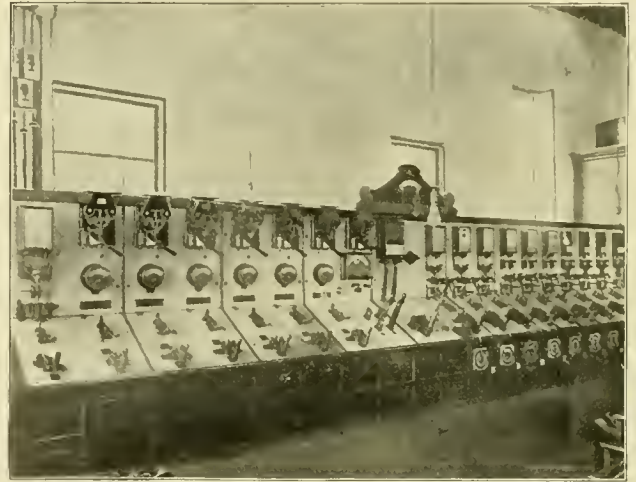


FIG. 8.—SWITCHBOARD, CALUMET ELECTRIC RAILWAY.

breaker which divides the current from the generator feed and the booster feed. When there are any break-downs at the Bowling Green power house, and it is necessary to run the Valley current through to Bowling Green, use is made of what are called jumpers from the two circuit breakers which divide the current from the Toledo & Maumee Valley and the Bowling Green lines."

The Scranton (Pa.) Traction Company has had in service for over a year a General Electric four-pole, 100-k. w. booster running at 750 r. p. m. The booster is engine driven and regulates the voltage from 550 to 750 according to the current demand. The line is 14 miles long and at the far end from the station there is a 10 per cent grade. The machine is connected in series with the switchboard bus bar and the feeder of the line on which it is used, with switches controlling a shunt so the booster may be cut out when desired. The booster is operated at all times when

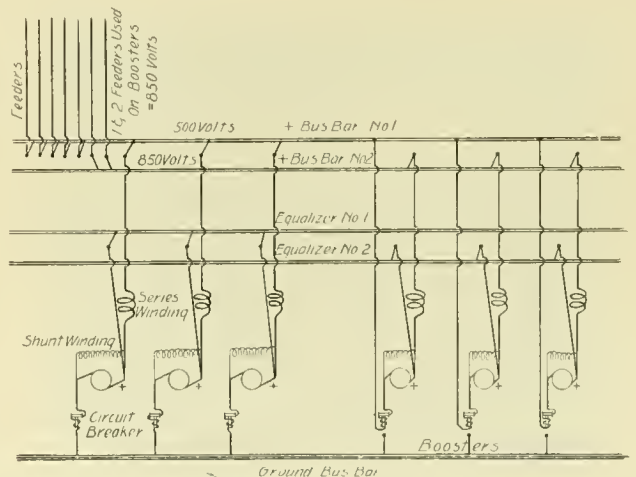


FIG. 8A.—SWITCHBOARD CONNECTIONS.



cars are running on this line. The small engine, which drives the booster, was one already in the station and which during the night is used for other purposes.

The Nassau Electric Railway Company, of Brooklyn, installed about 18 months ago a General Electric eight-pole, 200-k. w. booster for regulating the voltage on a line 9.14 miles long. The booster is engine driven and raises the voltage to 700. During the winter season the booster is in service from 6 a. m. to 9 a. m. and from 3 p. m. to 7 p. m., and during the summer from 1 p. m. to midnight. The installation gives satisfaction and is believed to be economical. A contract has been signed with the Westinghouse Electric & Manufacturing Company for two additional boosters with a total output of 3,750 amperes at 200 volts.

Some four months ago the Detroit Citizens Street Railway Company put in its station a 55-k. w. booster set to raise the voltage to 625 on a line 7.5 miles long. It was considered cheaper to drive the booster with a motor than an engine. The booster is in service from 7 a. m. to 8 p. m. every day and no trouble has been experienced.

In the power station of the Realty Syndicate Railways, of Oakland, Cal., a 30-k. w. booster has been operating over a year and a half. It is connected to a line running 7.84 miles from the plant and keeps the initial voltage at from 525 to 690. On one of the large engines there was an extra fly-wheel to which the booster was belted. The installation is considered economical as the ratio of the average load to the maximum is very low. On this line there is a 5.5 per cent grade and another 4.5 per cent grade seven miles from the station, over which an electric locomotive, equipped with four G. E. 1,200 motors, pulls trains weighing 38 tons. The booster is run 21 hours a day and no trouble has yet been experienced.

The Calumet Electric Street Railway Company, of Chicago, has a unique booster installation which is home-

made. The lines of this company pass through comparatively thinly settled districts and some of them are long and have few cars. As a consequence the feeders are not large and the loss of potential is very great whenever there is extra traffic. During the summer, when pleasure riding is in vogue, the facilities of the whole system are taxed to

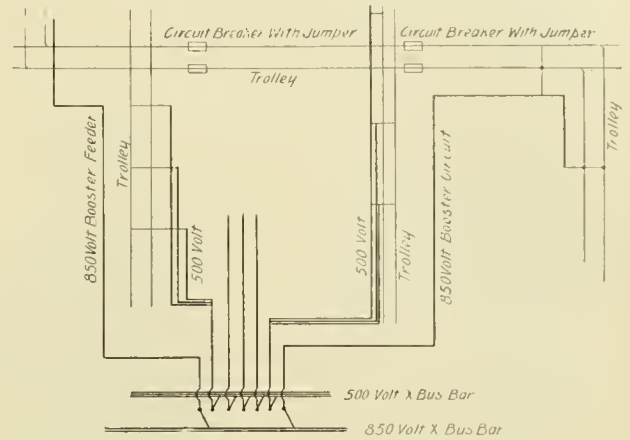


FIG. 8B.—FEEDER CONNECTIONS.

the utmost. Especially is this true of the trolley lines and feeders, for in some cases there is a drop of nearly 40 per cent in the voltage. The current was supplied from eleven 100-k. w. dynamos belted to high speed compound engines. A direct connected unit was installed, consisting of a cross-compound engine and a 550-volt, 500-k. w. General Electric generator, and this now carries the load of the station, the small dynamos being held in reserve. It was decided to use three of the small dynamos to boost the voltage on some of the long lines. Three 100-k. w. T.-H. dynamos, shown in Fig. 7, all belted to one engine, were selected for the service. The armature circuits were con-

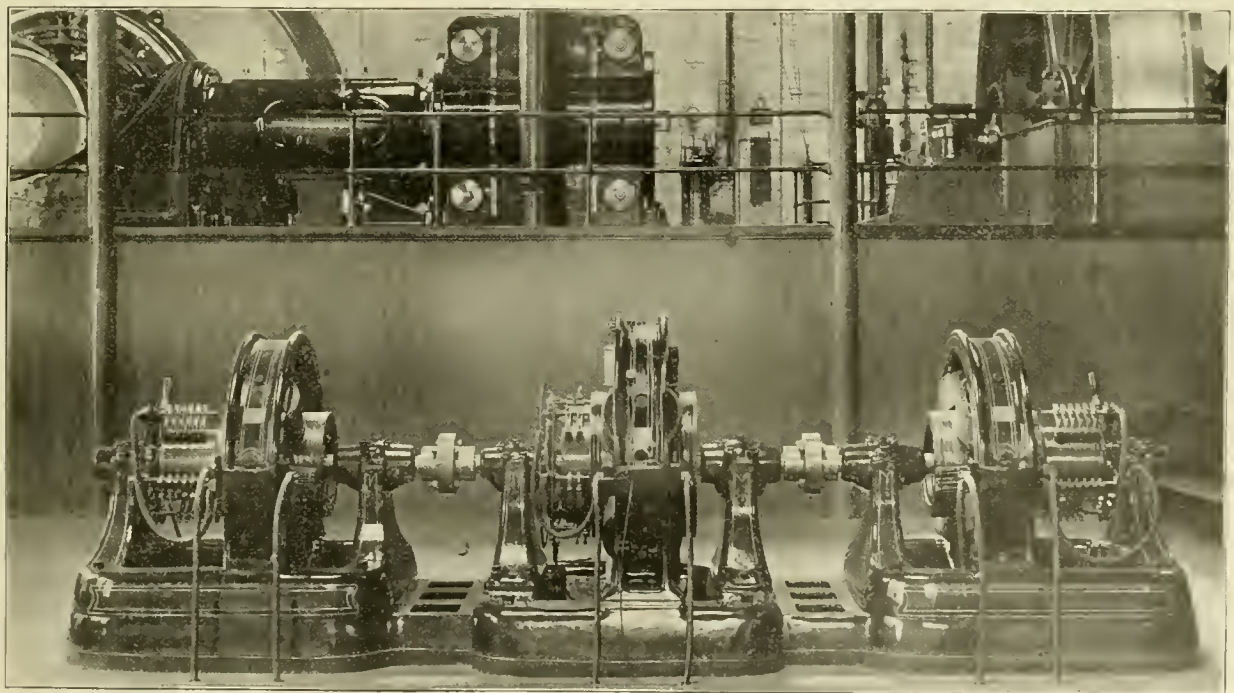


FIG. 9.—BOOSTERS, SOUTH CHICAGO CITY RAILWAY.

nected in parallel and the three in series with the main bus bar. The switchboard has two positive bus bars, one of which is at the station potential, 550 volts, and the other at the potential at the boosters. As may be seen in Fig. 8, each generator and feeder panel, on the switchboard, has a two-way switch which can be thrown on either bus bar. An equalizing circuit connects the three series field windings but does not extend to the switchboard.

With the shunt windings cut out of circuit the voltage

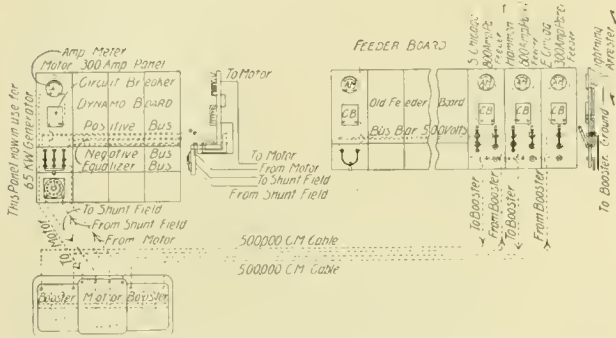


FIG. 10.—SWITCHBOARD CONNECTIONS FOR BOOSTER.

was boosted 150 volts but this was not sufficient. The shunt field was cut in and rheostats used to regulate the excitation. By this arrangement the potential was boosted 300 volts. At first there was some difficulty with this high voltage on some of the feeders as the current returned to the generator, but this was remedied by proper regulation. When it is necessary to run the boosters, the engine is started, the booster circuit connected to the high potential bus bar, the feeder circuit breaker is opened, the two-way switch thrown on the high potential bus bar and the feeder switch closed. The switchboard connections are shown in Fig. 8A, and a diagram of the feeder lines in Fig. 8B.

The boosters installed by the South Chicago City Railway Company at its central power house were for the purpose of generating all the current for all the lines at one station. Previous to this a small plant had been maintained to operate the Hammond branch at an expense of \$6,000 to \$7,000 per year. A 500-k. w., 550-volt direct connected Westinghouse generator was put in operation last year and furnished more power than necessary for all lines. With the feeders then strung there would be a loss of 300 volts on

a 150-h. p. 550-volt multipolar shunt-wound motor. The boosters are each capable of delivering 400 amperes at 125 volts and the voltage ranges downward with the current. A 25 per cent overload can be maintained for an hour. An automatic cut-out is provided for each booster when the circuit to the motor is broken so as to prevent the boosters running as series motors. Fig. 9 is from a photograph in the station showing the boosters. Either one or both of

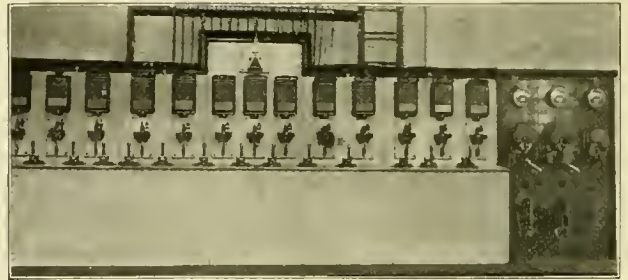


FIG. 12.—SWITCHBOARD, SOUTH CHICAGO CITY RAILWAY.

these boosters can be operated at the same time, the circuits to the one not in operation being broken and the armature revolves in a demagnetized field. The booster connections to the switchboard are shown in Fig. 10, and the trolley line and feeders to which one booster is connected are indicated in Fig. 11. Fig 12 is from a photograph of the feeder switchboard, with the booster board to the right. The apparatus is the product of the General Electric Company.

Besides the installations described there are several others in the country, including a four-pole 75-k. w. machine for the Lewiston & Youngstown Frontier Railway, two D-62 machines belonging to the Worcester Construction Company, a four-pole, 30-k. w. G. E. booster in the station of the Canandigua (N. Y.) Electric Light & Power Company and two Westinghouse outfits in the station of the Baltimore & Northern Electric Railway Company. One is a four-pole 50-k. w. 225 volt booster connected to a motor by flexible shafting. The generator is series wound and gives an electromotive force nearly proportional to the current at full load, after which the voltage rises very slowly, thus avoiding an excessive load on the motor which is shunt wound. The 125-k. w. outfit consists of two engine type fields on a common bed plate having two armatures on one shaft with two bearings.

## ICE CAUSES DELAY AT GRAND RAPIDS.

The Consolidated Street Railway Company, of Grand Rapids, Mich., was obliged to stop running cars for two hours, from 7 to 9 a. m., on February 2, on all except one of its lines. The power house is on the Grand river from which the water for the condensers and boilers is drawn. During the night the screens protecting the outer end of the intake pipe became broken and the pipe became clogged with ice. Though the trouble had been discovered during the night, and the engineer and his assistants spent the early morning hours in the river fighting the ice, a two hours' delay occurred before the pipe could be cleared and the screens repaired.

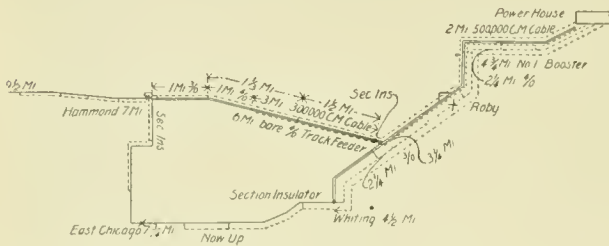


FIG. 11.—BOOSTER FEEDER LINES.

the Hammond line which extends 9½ miles from the station.

The engineering advice of Sargent & Lundy was sought and it was decided that the best economy would result from using boosters, motor driven at the central station, with the necessary feeders, and shutting down the small station. Two 50-k. w. multipolar, series boosters are direct connected to



**ANNUAL MEETING OF THE CHICAGO CITY RAILWAY.**

At the annual meeting of the Chicago City Railway on January 15, President Wheeler tendered his resignation, and three of the directors, D. K. Pearsons, E. M. Phelps and James C. King, retired from the board. The new board consists of Samuel W. Allerton, M. K. Bowen, D. G. Hamilton, Joseph Leiter, George T. Smith, William B. Walker and George H. Wheeler. The new officers are: M. K. Bowen, president; William B. Walker, first vice-president, and Joseph Leiter, second vice-president.

The reports of the president and secretary summarize the operations of the road as follows: The road earned from passengers \$4,781,055, and from other sources \$35,461, a total of \$4,816,518. The operating expenses for all systems were \$2,908,982, or 60.8 per cent of the passenger earnings. The revenue car-miles aggregated 24,378,000, a net decrease of 174,000 miles, divided as follows: Cable, 12,562,610 (decrease, 1,345,580); electric, 11,616,530 (increase, 1,598,510); horse, 198,860 (decrease, 427,830). On all lines, 95,621,112 revenue passengers were carried; 41,444,636 on cable lines (43.34 per cent); 53,485,425 on electric lines (55.94 per cent); and 691,051 on horse lines (.72 per cent). These figures do not include rides on transfers. Compared with the report for 1896 it is found that the increase in the car-miles run and passengers carried on the electric lines is greater than for the previous year. The daily receipts were \$13,099, an increase of \$88 over 1896; operating expenses were \$7,970 per day, a decrease of \$165. The horse lines showed a net loss of \$13,366, a decreased loss, however, over 1896 of \$5,144.

The operating expenses per car-mile, in cents, were:

	1896	1897
Cable lines . . . . .	10.540	10.706
Horse lines . . . . .	25.889	24.096
Electric lines . . . . .	13.467	13.051
All lines . . . . .	12.126	11.932

There have been 5.50 miles of new track built during the year, and 2.35 miles changed from horse to electric. The total mileage is now: Cable, 34.75 miles; electric, 149.74; horse, 5.23.

Dividends of 12 per cent were paid on \$12,000,000 of capital stock and 4½ per cent interest on \$4,619,500 of bonds, which left a surplus of \$209,656. This is an increase in the surplus over 1896 of \$57,231.

**THROUGH TRANSIT IN NEW YORK.**

On the morning of January 21, four trolley cars made the circuit of the Brooklyn bridge and inaugurated the through transit project which will do so much to increase the capacity of the bridge and save time for passengers. The cars left the City Hall square at 10:30 and the round trip was made in 12 minutes, 10 seconds. The cars were loaded with men prominent in politics and in the street railway world, all of the electric and elevated companies being represented by their highest officers. The street railways have made application for permission to operate a limited number of cars before the work of widening the bridge roadways is completed, since it was found at the trial trip that there is sufficient room.

**WILLIAM A. BANCROFT.**

William Amos Bancroft, vice-president of the Boston Elevated Railway Company, was born in Groton, Mass., April 26, 1855, and is descended from old colonial stock—his ancestors having landed in Massachusetts about 1640. His early life was spent on the farm and in the public schools and the Lawrence Academy in his native town. After attending Phillips Exeter he matriculated at Harvard College and was graduated from the Law School; he was admitted to the Suffolk bar in 1881. When in college Mr. Bancroft went in for athletics and was captain and stroke of three victorious crews, and later was, for five years, the "coach" of



WILLIAM A. BANCROFT.

others. When a freshman he enlisted as a private in the 5th regiment of the state militia; he has continued in the service and in July last was made brigadier general.

Thirteen years ago, January, 1885, Mr. Bancroft began his street railway career as general superintendent of the Cambridge Railroad; 15 months later this road was consolidated with the competing line, the Charles River Railway, and Mr. Bancroft became superin-

tendent of the two companies. His success in this position and especially his energy, firmness, tact and executive ability at the time of the strike in 1887 brought him into prominent notice, and when the West End Company absorbed the other roads of Boston, Mr. Bancroft was made general roadmaster of the system. In 1890 he left the street railway business and returned to the practice of law.

He has been prominent in politics, serving as common councilman, alderman, three terms in the legislature, and four years as mayor of Cambridge. While mayor he was made an overseer of Harvard College. For four years he has been president of the New England alumni of Phillips Exeter Academy; he is president of the Mayors' Club of Massachusetts and the First Volunteers Citizens' Association of Cambridge.

In March, 1896, he became one of the counsel of the Boston Elevated Railway Company, and in January, 1897, was elected vice-president and managing director, a position which will give full scope to his abilities, as he will now direct the management of the company. Nearly all the officials, subordinates and clerks of the new company were with the West End when Mr. Bancroft was roadmaster, so that he is no stranger to his working force.

When the American Association holds its coming meeting in Boston no one will be found who will extend a warmer welcome to the street railway fraternity than General Bancroft.

The bursting of a copper steam pipe in the boiler room of the Badger Illuminating plant of the Milwaukee Electric Railway & Lighting Company resulted in the death of the fireman, William Howse, and the injury of a laborer; these two chanced to be the only persons about the plant at the time.

### NEW PRESIDENT FOR ATLANTA CONSOLIDATED.

Ernest Woodruff, who has since 1893 been connected with the Atlanta (Ga.) Consolidated Street Railway Company, first as vice-president and later as vice-president and general manager, was, on January 19, elected president of the company.



ERNEST WOODRUFF.

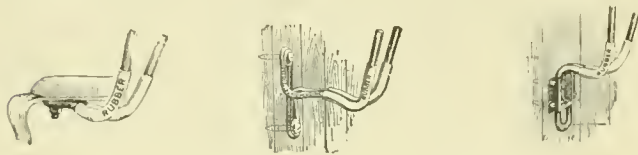
Mr. Woodruff is only 34 years old, but has had a long business experience. He was born at Columbus, Ga., and after graduating from the public schools he went into business with his father, and was for some years actively connected with the Empire flouring mills of Columbus. Since his connection with the Atlanta Consolidated Street Railway he has distinguished himself in his work, and his election to the presidency of the company is a fit recognition of his ability. The company operates 70 miles of track and has one of the finest street railway systems in the south.

Mr. Woodruff is a man of family and prominent in society. He has an elegant home at Inman park.

### "DUBLEOOK" BICYCLE HANGER.

In the last few years nearly all the street railways in the country have suffered greatly in their summer traffic from the great and growing use of the bicycle, and managers have been carefully considering how they can furnish transportation facilities for the accommodation of cyclists who may be caught in a storm or have their wheels disabled by accidents, and thus secure a portion of the business that has been lost. If the road is located in a city where there are steep hills, the opportunity for revenue from carrying wheels is greatly increased. During the last year in particular many roads have provided hangers on their cars with gratifying results in all cases.

The hanger which we illustrate is called the "Dubleook" or standard bicycle hanger and is manufactured by the Graham-Woodward Equipment Company, 26 Cortlandt



FOR DASH RAILS, VESTIBULES AND BAGGAGE CARS.

street, New York. It is made of the best steel and consists of hooks encased in rubber, and designed to be fastened to the front or rear dashboards of street cars or to the interior sides of baggage cars. The hangers for the interior are set in slots so that they may be easily removed as shown in the illustration. When suspended from these hooks by the handle bar, the bicycle rides perfectly rigid. When hung from the dash board the bicycle does not interfere with the movement of the brake handle, nor does it mar the car in any way.

The Market Street Railway Company, of San Francisco, states the two lines on which these hangers are used carry on an average of 1,800 bicycles a month, returning a revenue of \$180, that is 5 cents for the wheel and 5 cents for its owner. This gain in earnings is made without a corresponding increase in operating expenses, and as the wheels are carried at the owner's risk only (the trainmen do not han-



THREE BICYCLES AT EACH END—BROOKLYN.

dle the wheels at all), there is no liability for their damage incurred.

Several large roads have adopted these hangers and recently the New York Central Railroad adopted them for carrying wheels in its baggage cars.

### SORROWS OF STEAM ROADS.

President Clark, of the New York, New Haven & Hartford road, at the recent meeting of the New England Railroad Club, among other things, said:

"It has been decided by the railroad commissioners that an old law of this commonwealth, providing that after the lease of one railroad by another the accommodation shall not be diminished must be complied with, and standard roads are called upon to run trains which do not pay one-quarter of the cost of running them, because the construction of parallel electric railways has taken away most of their traffic. Some relief to your owners and to mine should be found, if possible, by which interests may be protected.

"Now, electricity, which is ordinarily steam power developed and conducted and made use of at various points away from the engine itself, affords a remedy for this in certain cases and in certain conditions. There is no longer question about that. The experiment of the New Haven road by the use of the third rail, which is only a trolley on the ground, shows us that with an adequate volume of business we may keep the requisite number of trains and afford the train service required without serious results. But on some light and side lines, to keep a locomotive, with its engineer and its fireman, with a baggage-master in the baggage car, and a



conductor to conduct his train, and a rear brakeman to look after accidents in the rear, is a burden which is entirely incommensurate with the revenue received. There is one electric railroad in this commonwealth which has taken from the New Haven Railroad in Massachusetts more than 90 per cent of its revenues, and we are obliged to pull a train backward and forward, with five men doing nothing, earning nothing, at a loss; to whom? To the people that employ them, the people that employ me."

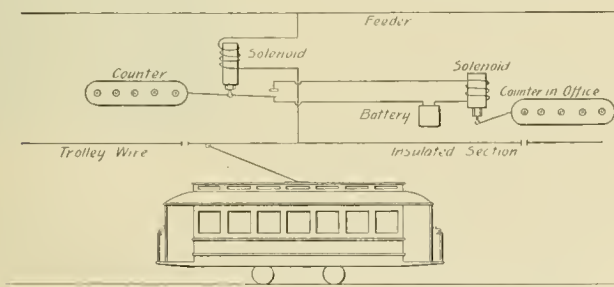
**CONSOLIDATION AT KNOXVILLE.**

As a result of the negotiations, which have been in progress for some months, the three street railway companies and the two lighting companies of Knoxville, Tenn., have been consolidated. The railway interests comprise the Knoxville Street Railway Company, the Fountain Head Railroad Company and the West End Street Railroad Company. This combination of companies will make a very strong organization and with the outside capital, which comes in, all the lines will be put in first-class condition.

**CAR COUNTER FOR BROOKLYN BRIDGE.**

When the agreement was made between the trustees of Brooklyn bridge and the street railway companies to operate trolley cars over the bridge, it was stipulated that there should be a toll of 5 cents for every trolley car that makes a round trip and 12 cents for every elevated car. As soon as the regular schedule is in operation the trolley cars will make from 3,000 to 5,000 trips per day and on the elevated about 2,000 car-trips per day. A record must be kept of each trip and C. B. Martin, who is at the head of the electrical department of the bridge, has devised an automatic electric counter which seems well suited for the work.

It is intended to put a short insulated section in the trol-



COUNTER FOR BROOKLYN BRIDGE LINES.

ley wire in front of the collector's box on the bridge. The section is connected to the feeder through a solenoid, and the plunger of the solenoid is attached to the lever of an ordinary engine revolution counter. When the trolley wheel comes in contact with the insulated section a circuit is formed between the feeder and the rail which causes the plunger to move, working the counter. A duplicate counter will be placed in the collector's box as a check on the other, and this one is connected up through a solenoid and battery as shown in the diagram. The position of the apparatus will be on a straight piece of track up grade, which will prevent coasting and slipping the trolley wheel off the wire. A three months' trial will be given before the adoption of this device.

**THE FIRST MOTORWOMAN.**

While society ladies have occasionally, for charity, conducted and operated the front platform, we believe the first woman to claim the distinction of making a thorough business of handling the controller and brake is Mrs. Mabell A. Brierly, of Matamoras, Pa.

In reply to our inquiry as to why she had pioneered in a field hitherto unoccupied by women, and how she liked the work, Mrs. Brierly replies:

"Yes, I have been at work on the Middletown-Goshen Traction Company, of Middletown, N. Y., for the purpose of becoming an experienced motorwoman that I might obtain a position as such to earn a living for myself and two children. I was treated kindly by the men on the road, and with all due respect. My instructor was especially kind, taking all possible pains to teach me how to handle the controller and brake, which I can now do very nicely. I have



MRS. MABELL BRIERLY.

received a good many letters similar to the one you have written, but this is the first I have answered."

Mrs. Brierly had no intention of applying for a position on the Middletown line, having been promised a position on another road if she would first become proficient in the work. Owing to the notoriety given the matter by the New York papers the case was a cause of no little annoyance to the officials, at the same time Superintendent Urban says she handled her car with ease and care, and managed the brake and controller very well.

Judging from all reports we should say in this particular case there seems to be no doubt that Mrs. Brierly is physically and mentally competent to take charge of the head end of a car; and as women are naturally more careful than men, it is fair to presume they would be less likely to take chances. As a rule, however, we should expect women to be less reliable in emergencies than are men, although Mrs. Brierly has turned out to be a first-class motorwoman.

Mrs. Brierly has no desire to seek notoriety, and has repeatedly declined requests for her picture. She has kindly, though reluctantly, given her consent to its publication here as a matter of history.

### M. K. BOWEN ELECTED PRESIDENT CHICAGO CITY RAILWAY.

At its annual meeting, January 15, Menard K. Bowen was elected president of the Chicago City Railway. The honor was one earned and deserved and is a fitting recognition of the six years of service, during which he rose from the position of assistant superintendent to the highest office in one of the largest and best known corporations in the country.

Mr. Bowen is a very young man in years to carry the responsibilities of so large an enterprise, but his friends have no fears for his success and properly regard the honor all the more pronounced on that account.

Mr. Bowen was born at Jefferson Barracks, a few miles below St. Louis, in 1858; his father was General John S.



M. K. BOWEN.

Bowen, and much of the military bearing and quick decision of the soldier is reflected in the son. He was educated at the St. Louis University and the Washington University of that city, and at the age of 19 entered the government service in the engineering department. In this work he was engaged in river surveys and, later, jetty construction on the lower Mississippi. In 1880 he took charge of the topographical survey from Fort Smith, Ark., through to California. It was as chief engineer and superintendent of construction of the Kansas City Railway, when that road installed the cable system, that Mr. Bowen entered the street railway field.

In 1892 he was made assistant superintendent of the Chicago City Railway, rising steadily through the positions of superintendent, general manager and vice-president until he became its chief executive officer.

Mr. Bowen is a man of remarkable keenness and capacity for work, which he turns off with great rapidity. He is progressive; a firm disciplinarian who, when threatened with a strike unless the union was recognized, promptly discharged the leaders and quickly put an end to the controversy. His paper at the St. Louis convention gave evidence of his ability as an originator, thinker and writer and was widely copied across the water.

All the conversion of horse to electric lines—some 150 miles—has been done under his supervision, and the new problems which already confront his company will doubtless be worked out as speedily and successfully. He is a man of unusual executive ability, easy to approach and pleasant, with a bearing dignified and gentlemanly.

When Mr. Bowen was elected general manager of the company in January, 1897, some changes were necessarily made in the scheme of organization which obtained before that time, as it did not provide for such an officer, his duties devolving upon the president. The new scheme was described in the "Review" for March, 1897, page 180. With Mr. Bowen's election to the presidency the office of general manager was abolished and the requisite changes made in the organization. The treasurer, the secretary, the purchasing agent, the auditor, the general counsel, the chief of construction, the chief draftsman and the superintendent report direct to the president. The superintendent receives direct the reports of the interior departments, and through the assistant superintendent the reports of the track and line departments, barn foremen, etc.

The new superintendent, George O. Nagle, was born in Milton, Pa., December 31, 1868. In 1874 his family moved to Belle Plaine, Ia., where his father died one year later; the family then removed to Lima, O., where Mr. Nagle received his education in the public schools. Coming to Chicago with his mother and sisters in 1886, he attended the Chicago Atheneum for a short time, and the following year began work in the office of the Cragin Manufacturing Company. Shortly afterwards he left to go with the Chicago, Burlington & Quincy Railroad; he continued with this road, first in the ticket auditor's office and later in the general auditor's office, until February, 1891, when he entered the employ of the Chicago City Railway Company as junior in the claim department. Six months later he was promoted to the position of private secretary to the superintendent, which he held until appointed superintendent on January 18, 1898. He is a young man of much promise, and with the increased opportunities may confidently be expected to make an enviable record.



GEORGE O. NAGLE.

August C. Heidelberg, who for three years has been trackmaster of the road, has been appointed assistant superintendent and will have charge of the outside work of the superintendent's office; that is, the track and line departments, with supervision of barn foremen, supervisors, etc.

G. W. Knox has been appointed to the position of electrical engineer and engineer of construction, and C. J. Reilly is superintendent of motive power in charge of both the cable and electric power stations.



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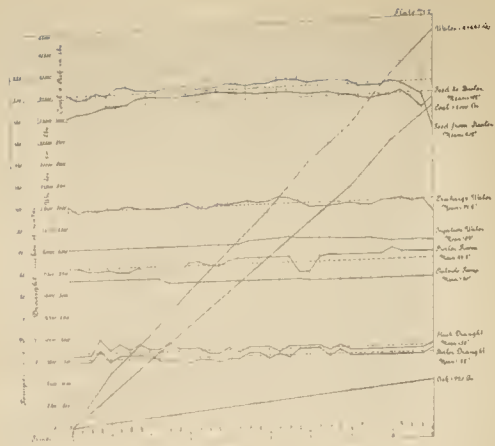


Fig. 7—Boiler Test, November 1, 1897.

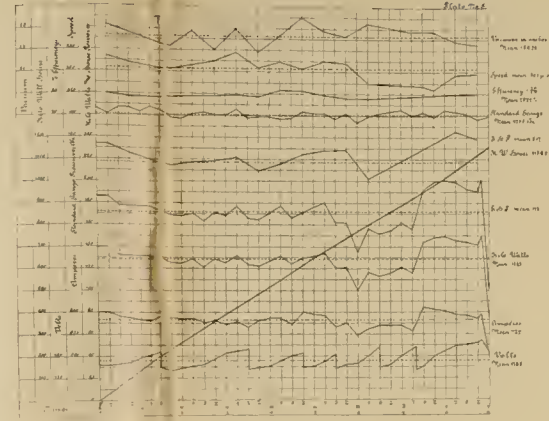


Fig. 8—Log of Engine and Generator Test, November 26, 1897.

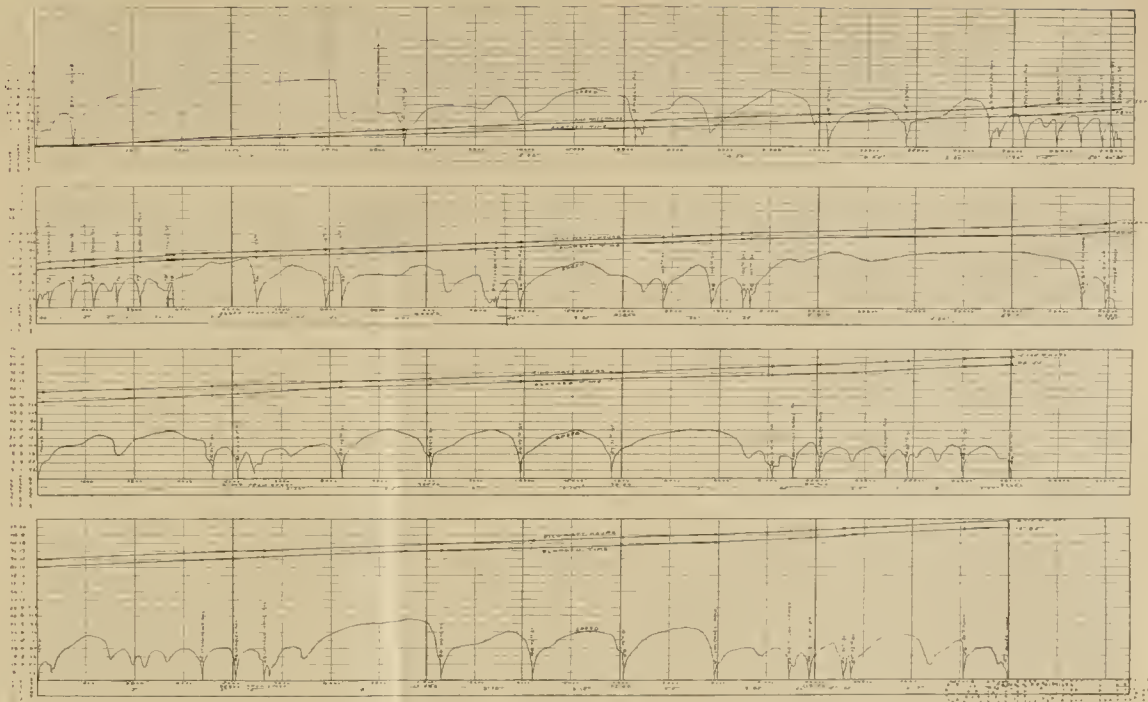


Fig. 12—Speed Record Car No. 14, Battery No. 1.

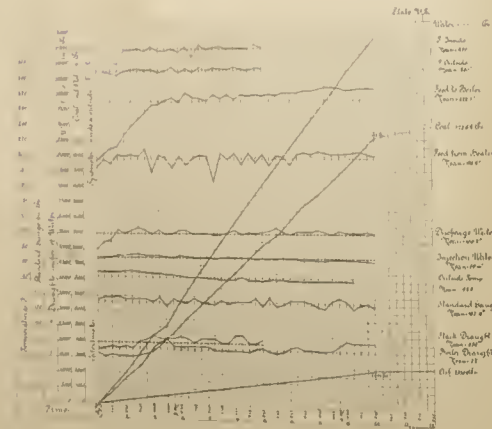


Fig. 9—Log of Boiler Test, November 5, 1897.

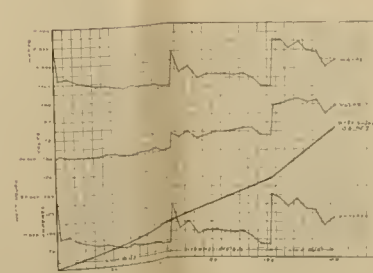


Fig. 10—Log of Charge No. 1.



Fig. 11—Log of Charge No. 2.

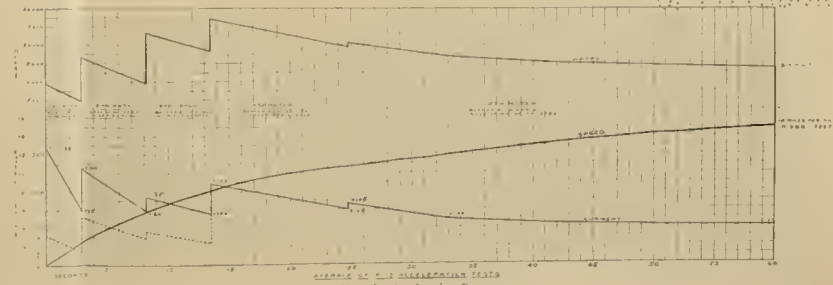


Fig. 13—Acceleration Diagram.



## ELECTRIC TRAMWAYS IN THE UNITED KINGDOM.

Location.	Operating Company.	Manager.	Length of Line, Miles.	Length of Track, Miles.	Gage, Ft. In.	Method of Transmission.	No. of Motor Cars.	No. of Trail Cars.
Bessbrook .....	Bessbrook & Mewry Tramways Co.....	Wm. McCombe....	3.	3.5	3-0	Third rail.....	2	32
Birmingham .....	City of Birmingham Tramways Co.....	F. W. Warren .....	3.	6.	3-6	Accumulators..	10	2
Blackpool.....	Blackpool Corporation...	John Lancaster....	3.	4.	4-8½	*Conduit.....	14	..
Brighton .....	Magnus Volk.....	Magnus Volk.....	1.	1.	2-8½	Third rail.....	5	1
Bristol .....	Bristol Tramways Co.....	G. White.....	4.	6.	4-8½	Overhead.....	20	15
Bristol .....	Bristol Tramways Co.....	G. White.....	2.	4.	4-8½	Overhead.....	12	12
Coventry.....	Coventry Electric Tramways Co.....	T. R. Whitehead....	6.	6.	3-6	Overhead.....	10	0
Dover .....	Dover Corporation.....	Edward Carden....	3.5	4.5	3-6	Overhead.....	10	2
Dublin .....	Dublin United Tramways Co.....	Wm. Anderson.....	8.	15.	5-3	Overhead.....	30	30
Dublin .....	Dublin United Tramways Co.....	Wm. Anderson.....	3.	6.	5-3	Overhead.....	15	..
Giants Causeway .....	G. C. Electric Tramways Co.....	D. Fall, Jr.....	8.	8.5	3-0	Third rail.....	4	4
Guernsey .....	Guernsey Ry. Co.....	H. W. Miller.....	3.	3.	4-8½	Overhead.....	8	7
Hartlepool.....	Gen. Elec. Tramways Co	S. S. Galsworthy....	2.56	3.4	3-6	Overhead.....	8	2
Douglas.....	Isle of Man Tramways Co	John Aldworth.....	7.	14.	3-0	Overhead.....	13	14
Snafell Mountain.....	Isle of Man Tramways Co	John Aldworth.....	4.75	9.5	3-6	Overhead.....	6	2
Douglas.....	Douglas Southern Electric Tramways Co.....	Sydney Lynch.....	3.25	3.5	4-8½	Overhead.....	8	8
Leeds .....	Leeds Corporation.....	Wm. Wharam.....	7.	14.	4-8½	Overhead.....	25	10
Isle of Wight .....	Ryde Pier Co.....	F. E. Kemp.....	.75	1.5	4-8½	Third rail.....	2	2
Southend Pier.....	Southend Corporation...	Jas. Kelly.....	1.25	1.25	3-6	Third rail.....	3	6
Walsall .....	South Staffordshire Tramways Co.....	J. J. Robins.....	8.	8.5	3-6	Overhead.....	16	..

\*Blackpool road now being changed for overhead working.

## ELECTRIC TRAMWAYS UNDER CONSTRUCTION.

Blackburn.....	Blackburn Corporation Tramways Co.....	.....	.....	.....	.....	Overhead.....	.....	.....
Blackpool.....	Blackpool & Fleetwood Tramroad Co.....	— Cameron.....	8.	16.5	4-8½	Overhead.....	12	12
Cork .....	Cork Electric Tramway & Lighting Co.....	.....	11.	11.	3-0	Overhead.....	18	.....
Coventry (Extensions)...	Coventry Electric Tramways Co.....	F. R. Whitehead....	5.25	5.25	3-6	Overhead.....	.....	.....
Dublin .....	Dublin United Tramways Co.....	Wm. Anderson.....	40.	80.	5-3	Overhead.....	155	.....
Glasgow .....	Glasgow Corporation...	John Young.....	3.	6.	4-8½	Overhead.....	.....	.....
Halifax .....	Halifax Corporation...	E. R. S. Escott.....	3.5	4.25	3-6	Overhead.....	10	.....
Hull.....	Hull Corporation.....	.....	9.5	18.5	4-8½	Overhead.....	.....	.....
Laxey.....	Isle of Man Tramways Co	J. Aldworth.....	10.5	21.	3-0	Overhead.....	9	9
Kidderminster.....	British Electric Traction Co.....	E. Garcke.....	4.48	4.72	3-6	Overhead.....	.....	.....
Liverpool .....	Liverpool Corporation...	John O'Neill.....	3.	6.	4-8½	Overhead.....	.....	.....
Middlesbro' .....	Middlesbro' Tramways Co.....	J. C. Robinson.....	11.	22.	3-6	Overhead.....	50	.....
Norwich .....	Norwich Electric Tramway Co.....	.....	19.	19.	3-6	Overhead.....	40	.....
Oldham.....	British Electric Traction Co.....	E. Garcke.....	8.11	10.35	3-6	Overhead.....	18	.....
Plymouth.....	Plymouth Corporation..	C. R. Everson.....	1.8	3.6	3-6	Overhead.....	5	.....
Poiteries.....	British Electric Traction Co.....	E. Garcke.....	12.47	16.6	4-0	Overhead.....	.....	.....
Sheffield .....	Sheffield Corporation...	G. H. Mallyon.....	3.	6.	4-8½	Overhead.....	.....	.....
Stoke.....	North Staffordshire Tramways Co.....	.....	6.75	8.	4-8½	Overhead.....	20	.....
West Hartlepool.....	British Electric Traction Co.....	E. Garcke.....	2.14	2.39	3-6	Overhead.....	.....	.....

## TRAMWAYS IN THE UNITED KINGDOM.

The accompanying table is abstracted from one published in the Railway World for January and gives the location, operating company, manager, length, method of operation, and number of cars, for the electric tramways of the United Kingdom, including those under construction. The 20 lines in operation have an aggregate length of 82.06 miles, with 123.15 miles of track. The 19 lines under construction aggregate 162.50 miles with 261.16 mile of track; this does not include the Blackburn line, for which data are not given.

In addition to the tramways there are five electric railways, so called. Two of these—the Central London, with

6.5 miles of double track, and the Waterloo & City Railway, with 1.5 miles of double track—are under construction, these and the City & South London Railway, which has had three miles of double track in operation since December, 1890, are underground roads in London, using the third rail. These are all of standard gage—4 ft. 8½ in. The City & South London operates 16 motor and 36 trail cars.

The other electric railways are the Liverpool Overhead with 6.5 miles of double track, standard gage, and 44 motor and seven trail cars; and the Brighton & Rottingdean Seashore Railway, which was illustrated in the "Review," December, 1896.

The most striking feature of the table is that notwith-

standing the objections urged against the overhead trolley in Europe, of which we have heard so much, the overhead trolley has a clear field on all new surface lines, and of the 20 roads in operation five are using the third rail, one using accumulators, and 13 using the overhead trolley, while the only underground conduit line in England is changing to the overhead system.

**INTERNATIONAL RAILWAY MEETING.**

Arrangements have been made for an international meeting of the street railway, gas, and electric light and power men of the United States and Mexico in March next. A special meeting of the executive committees of the Texas Street Railway Association and of the Texas Gas & Electric Light Association was held at Austin on January 16. At this meeting it was decided that the two associations hold a joint meeting at Laredo, Tex., on March 9 to 12, inclusive. Letters were read from L. J. Christen, mayor of Laredo, promising that he and the citizens would do everything possible for the entertainment of the members and visitors of the association, and C. F. Yeager, superintendent of the Laredo Electric & Railway Company, stated that every preparation for the comfort of delegates and visitors would be made, that ample hotel accommodations

Committees on arrangements, transportation, etc., were appointed, and they have been very active in planning a successful convention, in which the social features will not be overlooked.

According to the program, which covers every minute of the time from the morning of Wednesday, March 9, until the following Monday, with meetings or entertainments, about one-half the sessions will be separate, and the others joint meetings of the two associations. At the separate meetings are to be presented those subjects which are of peculiar interest to the members of one association only, and at the joint meetings the subjects of more general interest. A number of the Mexican delegates will read papers, and as the Texas association is noted for its good work, much will be expected on this occasion.

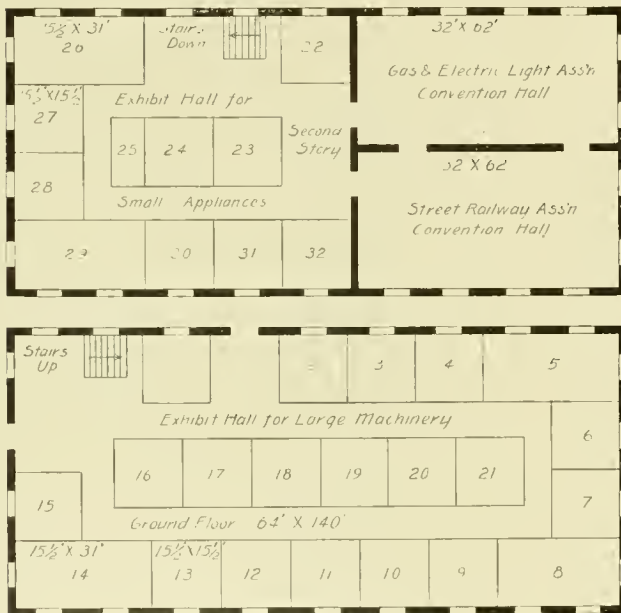
The papers before the Street Railway Association and before the joint meetings are as follows:

- "A Chapter on Accidents," by George B. Hendricks, Fort Worth.
- "Use and Abuse of Electrical Machinery, Apparatus and Appliances," by Harry L. Monroe, Dallas.
- "Car Bodies; Their Maintenance and Repair," by Frank E. Scovill, Austin.
- "Trucks and Their Maintenance," by George D. Hartson, Dallas.
- "Railbonding as a Power Saver," by H. C. Chase, Houston.
- "An Electric Furnace; Calcium Carbide, Acetylene Gas and Other Forms of Gas," by J. D. Cox, Galveston.
- "Ties; Their Life and Preservation," by D. D. Willis, San Antonio.

A number of other papers will be presented, on subjects to be chosen by the authors.

The most pleasing feature of the convention as planned is that it will bring into closer relations with us those of our Mexican neighbors who are interested in the same work. There has been marked progress on the street railway lines of Mexico in the last few years, and we can look forward to a rapid improvement in the near future. For this reason the facilities afforded for exhibiting apparatus will without doubt be gladly availed of by our manufacturers, and the exhibits prove to be extensive and interesting, as is the hope of those in charge to make them.

The joint executive committee having the international meeting in charge comprises Carl F. Drake, president of the Texas Street Railway Association; L. T. Fuller, president of the Texas Gas & Electric Light Association; W. E. Holmes, R. S. Wakefield, Thomas D. Miller, Frank E. Scovill, C. L. Wakefield, Geo. H. Cushman and J. H. Fitzgerald.



PLAN OF EXHIBIT HALL, LAREDO, TEX.

were assured, and that a large and convenient hall for the meetings and exhibits would be provided.

Mr. Yeager further stated that the Mexicans who are connected with the lighting, street railway and power interests of Mexico had shown great interest in the proposed meeting, and that the Mexican Government, through its Department of Foreign Affairs and through Senor Ornelas, Mexican consul at San Antonio, had expressed interest in the meeting and tendered offers of assistance, and that a large attendance might be expected from Mexico. It was then unanimously decided to make the meeting an international one, and the two associations extended invitations to the gas, electric, street railway and power men of Mexico to be present and read papers at the meeting.

**NEW SERVICE FOR STREET RAILWAY MOTORS.**

An electric hoist and cable way has been installed at the lime quarry of the S. E. & H. L. Shepherd Company, Rockport, Me., and the hoist is equipped with two G. E. 1,200, 500-volt railway motors, with K-11 controllers. The apparatus is built for lifting a load of 10 tons, and is capable of hoisting 2,000 casks of lime rock in a day. The current is furnished from the railway circuit of the Knox Gas & Electric Company at the rate of 4 cents per h. p.-hour. The cable way is 700 ft. long, suspended from two towers, one 55 ft. high, and the other, the main hoisting tower, is 65 ft. high. This is the third plant in the county to adopt electricity, and all of them are using the General Electric railway motors with series-parallel controllers.



## STREET RAILWAY LAW.

EDITED BY FRANK HUMBOLDT CLARK, ATTORNEY AT LAW, CHICAGO.

*Assignment of Claims for Personal Injuries.*

The sale or assignment of an action for injuries to the person is against public policy and void.

A contract whereby a client is prevented from settling or discontinuing his suit is void.

In the opinion of the Court, Phillips, Chief Justice, says:

On grounds of public policy the sale or assignment of actions for injuries to the person are void. The law will not consider the injuries of a citizen whereby he is injured in his person to be, as a cause of action, a commodity of sale. On other grounds assignability is not legal.

In this discussion of the question of assignability of causes of action for torts, courts have usually based the decision on the theory that where no cause of action survived it was assignable. Is that the sole test?

Bingham's Principles of Eq., pp. 218, 219, states:

"So, too, equity will not recognize assignments of certain species of property, which would be against the policy of the law to allow the owners to part with. These are pensions given as rewards for extraordinary services, pay or half pay in the army, the salaries of judges, and other revenues and emoluments of a kindred character, which reasons of state require should remain always for the benefit of the person to whom they were originally given. \* \* \* Yet in all these cases any balance unpaid at the time of death would survive to the present representative, but the right of assignment is precluded on principles of public policy."

Pomeroy, in his work on Eq. Jurisprudence, says:

"Sec. 1,275. It becomes important, then, in fixing the scope of the equity jurisdiction, to determine what things in action may thus be legally assigned. The following criterion is universally adopted. All things in action which survive and pass to the personal representative of a decedent creditor as assets or continue as liabilities against the representatives of a decedent debtor, are, in general, thus assignable; all which do not thus survive, but which die with the person of the creditor or of the debtor, are not assignable. The first of these classes, according to the doctrine prevailing throughout the United States, includes all claims arising from contract, express or implied, with certain well defined exceptions; and those arising from torts to real or personal property, and from frauds, deceits and other wrongs, whereby an estate, real or personal, is injured, diminished or damaged. The second class embraces all torts to the person or character where the injury and damage are confined to the body and the feelings; and also those contracts, often implied, the breach of which produces only direct injury and damage, bodily or mental, to the person, such as promises to marry, injuries done by the want of skill of a medical practitioner, contrary to his implied undertaking, and the like; and also those contracts, so long as they are executory, which stipulate solely for the special personal services, skill or knowledge of a contracting party."

Here is a distinction clearly drawn between injuries to property and injuries to the person. This distinction rests on a sound principle. If a person receives injuries to his

person through negligence of another they are, by our statute, Sec. 123 of Ch. 3, made to survive. By Ch. 70, where death results from such injuries caused by such negligence of another the action shall survive, but is brought for the exclusive benefit of the widow and next of kin. The administrator can not recover damages for the estate and at the same time recover for the exclusive benefit of the widow. Statutes like Ch. 70 are in force in most of the states. May a person injured assign the cause of action immediately after his injury, and then in case of his death from that injury legally make that assignment bar a recovery by the administrator for the exclusive benefit of the widow and next of kin? The purpose of Ch. 70 was not for the benefit of a deceased person, but for that of the widow and next of kin.

If an assignment on the basis of the survivor of the action was the sole test, then in the case mentioned the assignment would be valid. But the very purpose of the survivor as created by the statute is for the benefit of the widow and next of kin, which the law would not permit to be defeated. Whether the action be for assault and battery or injuries caused by the negligence of another, still the same rule attains and is included by the term, actions for injuries to the person, and as a possible result of such an assignment the purpose of the law might be defeated. Courts have without any exception steadily held that an action for injuries to the body was not assignable.

These actions did not survive at common law, and statutes providing for such survival have had their birth since the passage of Lord Campbell's act in 1852, which by Ch. 70 of our Revised Statutes is substantially adopted.

If such actions are held assignable on the sole ground of survivor, those or assignees in bankruptcy, or under the benefit of creditors, would take the cause of action.

This principle that actions for personal injuries are not assignable is well sustained by authority in *Rice v. Stone*, 1 Allen, 568; it was held that an assignment of a claim for personal injuries is void, although made after verdict but before judgment in an action to recover damages for such injury.

The court says: Such claims were not assignable at common law. On the contrary, a possibility, right of entry, thing of action, cause of suit or title for condition broken, could not be granted or assigned over at common law. But this ancient doctrine has been greatly relaxed. Commercial paper was first made assignable to meet the necessities of commerce and trade. Courts of equity also interfered to protect assignments of various choses in action, and after a while courts of law recognized the validity of such assignments, and protected them by allowing the assignee to use the name of the assignor for enforcing the claim assigned. And at the present day claims for property and for torts done to property are generally to be regarded as assignable, especially in bankruptcy and insolvency. There may be exceptions to this doctrine, but they need not be discussed here. But in respect to all claims for personal injuries, the questions put by Lord Abinger, in *Howard v. Crowther*, 8 M. & W., 603, are applicable: Has it ever been contended

that the assignees of a bankrupt can recover for his wife's adultery or for an assault? How can they represent his aggravated feelings? And we may add the broader inquiry—has any court of law or equity ever sanctioned a claim by an assignee to compensation for wounded feelings, injured reputation or bodily pain suffered by an assignor? There were two principal reasons assigned why the assignments above mentioned were held to be invalid at common law. One was to avoid maintenance. In early times maintenance was regarded as an evil, principally because it would enable the rich and powerful to oppress the poor. This reason has in modern times lost much but not the whole of its force. It would still be in the power of litigious persons, whether rich or poor, to harass and annoy others if they were allowed to purchase claims for pain and sufferings and prosecute them in courts as assignees. And as there are no counterbalancing reasons in favor of such purchases, growing out of the convenience of business, there is no good ground for a change of the law in respect to such claims.

The other reason is a principle of law applicable to all assignments, that they are void unless the assignor has either actually or potentially the thing which he attempts to assign. A man can not grant or charge that which he has not.

\* \* \* \* \*

The second proposition to be determined is, is a contract by which the person in whose name the action is brought and to whom it belongs restricted from compromising or settling such claim because of a contract to that effect? In other words, is such a contract valid and binding? The law does not discourage settlements in cases for personal injuries. Whether a cause of action exists, its nature and amount are always involved in uncertainty, and a defendant has a right to buy his peace. The plaintiff has a right to compromise and avoid this anxiety resulting from a cause pending to which he is a party. Any contract whereby a client is prevented from settling or discontinuing his suit is void, as such agreement would foster and encourage litigation: *Lewis v. Lewis*, 15 Ohio, 715; *Elwood v. Wilson*, 21 Ia., 523; *Foster v. Jacks*, 4 Wall., 334; *Boardman v. Thompson*, 25 Ia., 487; *Greenhood on Public Policy*, 474; *Kriber v. Johnson*, Miss. 70 N. W. R., 305.

(Supreme Court of Illinois, *North Chicago Street Railway Co. v. Ackley*, 30 Chicago Legal News, 156.)

*Running Electric Cars at Rapid Rate over Much-Frequented Crossing—Proof of Want of Contributory Negligence by Person Injured.*

Running an electric car at an unusually rapid rate over a much-frequented crossing, when the usual rate was from 12 to 14 miles per hour, was such negligence as constitutes little less than wanton and reckless negligence of human life, but it is held that some slight proof at least of a want of contributory negligence was required in case of a man killed by the car and found about 45 ft. from the crossing at which he had stepped from another car.

(Supreme Court of Indiana, *Evansville Street Railway v. Gentry*, 37 Lawyers' Reports Annotated, 378.)

*License Tax for Revenue Purposes—Exemption of Street Railway.*

The exemption of a street railway from a license tax is not granted by a mere grant of the privilege of operating the road for a term of years, if the license tax is imposed

under statutory authority, although for revenue purposes and not simply for police regulation.

(Supreme Court of Missouri, *Springfield v. Smith*, 37 Lawyers' Reports Annotated, 446.)

*Collision of Fire Truck with Street Car—Negligence of Driver of Truck.*

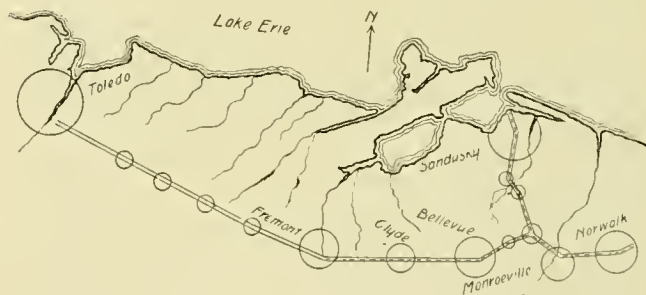
Driving a fire truck to a fire so rapidly that on approaching an electric street car track it is impossible to stop in time to avoid a probable collision, constitutes negligence on the part of the driver, although by the city ordinances he had the right of way.

(Supreme Court of Michigan, *Garrity v. Detroit Citizens Street Railway Co.*, 37 Lawyers' Reports Annotated, 529.)

## SANDUSKY, NORWALK & TOLEDO.

The above title is the name of a company which has already entered on its construction work, and will eventually build some 40 miles. The operation has been taken up by a syndicate of Philadelphia gentlemen, and A. E. Tennis, Harrison building, Philadelphia, is in charge of the financing and contracting. The engineers are Fowler & Loomis, 436 Walnut street, Philadelphia.

The company have already secured the Sandusky road of



10 miles and will build from that point to Norwalk, passing through Bloomingville, where the power house will be erected, North Monroeville and Monroeville, a distance of 18 miles. At North Monroeville a branch will extend 22 miles, connecting up Bellevue and Clyde with power house at Clyde. The extension on to Toledo will be taken up in the near future. Already three 325-k. w. generators and 1,000 h. p. of engines and boilers have been purchased. There are yet to purchase 12 passenger cars, 1 combination and 1 construction car.

The accompanying map gives an excellent idea of the territory traversed, which will be recognized as densely populated, and opening a desirable field.

For some years it has been the custom of Superintendent T. M. Jenkins, of the Cincinnati, Newport & Covington Street Railway Company, to offer cash prizes to employes for carefulness, tidiness and good demeanor. This year two motormen were each rewarded with \$25 in gold for not having an accident for 12 months, and seven others received \$10 each for having avoided all but very minor mishaps. One conductor was rewarded \$25 for keeping the cleanest car during the year, four others were given \$10 and four more \$5 each.



**SNOW PLOW AND SALT CAR, LEXINGTON, KY.**

Through the courtesy of R. T. Gunn, superintendent and electrician of the Passenger & Belt Railway Company, Lexington, Ky., we have received the photograph from which the accompanying engraving is reproduced. This car was built, not so much for a snow plow, as to furnish a car for effectively salting the track when the rails are covered with sleet; sleet is the cause of much more serious trouble for the street railways in Kentucky than is snow. While it has



SNOW PLOW AND SALT CAR.

not as yet been found necessary to use the large plow, the smaller plows or rail cleaners have been called into requisition a number of times during the present season.

The entire plow is bolted to the car in such a way that it may be quickly removed and the car used for construction purposes. The car is mounted on a Bemis No. 6 truck equipped with two 50-h. p. waterproof motors. The car was designed and built under the supervision of Superintendent Gunn and E. A. Longmire, foreman of the company's shop.

**COLORADO RAILWAY NEWS.**

(By Our Own Correspondent.)

The Boulder & Denver Railway Company has been incorporated to build an electric line 30 miles in length between the two cities. It is for the cheap transportation of ore and freight, as well as passenger traffic. It is intended to have an hourly schedule, the trains consisting of one combination baggage and passenger car and two coaches.

Numerous improvements are contemplated by the Durango Railway & Realty Company. Already the line has

been extended to the mineral springs, where there is a pleasure resort. In the spring a new power station will be built and some open cars purchased for the summer traffic.

About one-third of the Denver, Lakewood & Golden Railroad is operated by electricity, the power being furnished by the Denver Consolidated Tramway Company. It is expected that the remainder of the line will be equipped for electric traction in the near future.

The Gold Hill Tunnel & Railway Company has been organized by the H. J. Mayham Investment Company for the purpose of absorbing the Denver & Westminster Railway Company and to construct an electric line to Westminster University and to Gold Hill.

The Colfax Electric Railway Company has been operating its cars at a loss for the past seven months, and with the exception of two cars a day to hold the franchise, has ceased running cars.

The Colorado Springs & Cripple Creek Traction Company is extending branches to its line to the different mines and ore-houses in the Cripple Creek district. About 100 ore and freight cars are in service besides three trail cars and six motor cars, four of which are of the combination baggage and passenger type. This same company controls two others which contemplate building lines from Colorado Springs to Pueblo and from Denver to Colorado Springs.

The Colorado Springs Rapid Transit Company has received four open cars of the 10-bench type built by the Wells & French Company and mounted on McGuire trucks. During this coming season the company expects to extend some of its lines and rebuild some of the old track.

The Pueblo Street Railway Company has built five combination cars, 30 ft. long and with a seating capacity for 42. The cars are open at either end, with a closed apartment in the middle. They are equipped with G. E. 800 motors; two cars are mounted on Peckham trucks and three on Bemis trucks.

The Denver Consolidated Tramway Company is rebuilding a large number of cable cars for trailers on the electric lines, and the repair shops are busy fitting the cars with vestibules. The center pole construction has been replaced by poles at the sides of the streets. There are rumors that negotiations are in progress to consolidate this company with the other four large ones in the city.

**LOOK OUT FOR THE HIP-JOINT MAN.**

It is stated that the claim agents and attorneys of one of the railroads entering Indianapolis are searching for a professional contortionist who has chosen for an avocation the dislocating of his hip joint when the circumstances are favorable to securing a verdict for damages against a railroad company. Some months ago a man fell on the platform of a passenger station near Indianapolis, having caught his heel in a crack, and the result was a dislocated hip. The company settled for \$2,200 and attorney's fees, and extended courtesies in the way of furnishing transportation for the man and his nurse, etc. Quite recently a similar accident occurred in Virginia, and a claim for damages presented. The man had been seen the day before hunting about the platform for a hole in which to catch his heel, and a traveling man who was present recognized him as the victim of the "accident" in Indiana. The Virginia road did not settle.

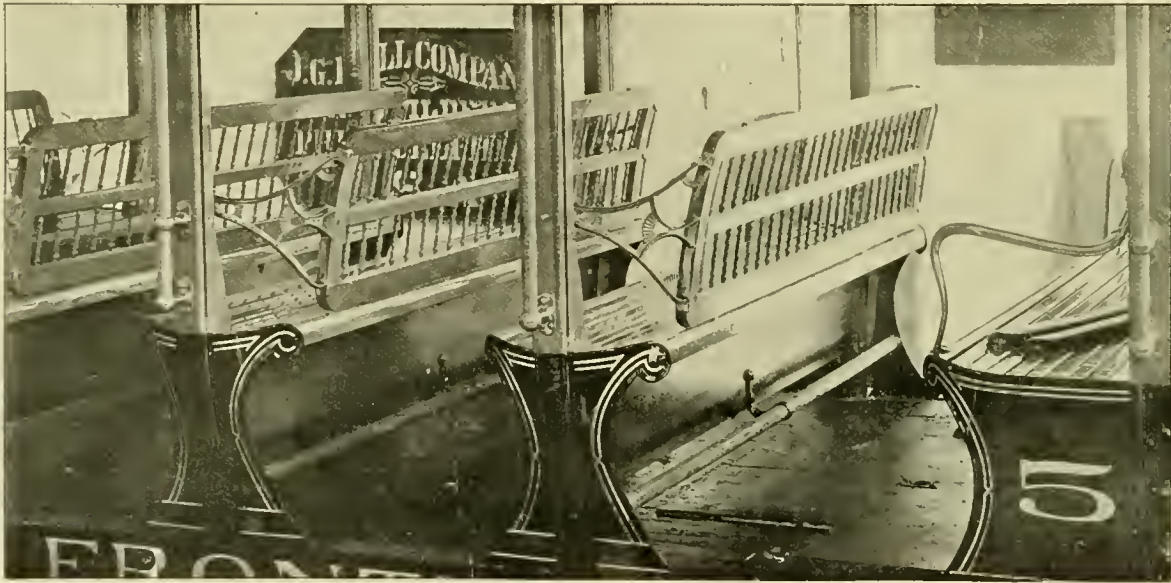
## ROUND-CORNER SEAT-END PANELS.

The open cars for street railways have become a necessity for summer traffic, but everyone who has ridden on one in wet or stormy weather, or stood upon the running board when the seats were full, appreciates that there are some disadvantages in the usual construction. A recent improvement in a detail introduced by the J. G. Brill Company affords the means of overcoming some of the inconveniences to passengers and reducing the cost of maintenance to the road. This consists in making the seat-end panels with round instead of square corners. The illustration shows a view of a car with panels of this style.

The end of the seat is so rounded that the inside end of the curve is directly above the outside edge of the sill, and the iron panel is so formed at the top as to fit the seat. As the seat end has the same curve as the seat back arm, the

## REPORT OF THE NATIONAL, ST. LOUIS.

The annual meeting of the National Railway Company, which controls the Cass Avenue & Fair Grounds, the Citizens' and the St. Louis roads of St. Louis, was held at Chicago on January 25. The report of President D. G. Hamilton shows the gross receipts for the year ending December 31, 1897, to be \$1,467,976; the current operating expenses, \$879,940, which is 59.9 per cent of the receipts; the fixed charges, \$366,746; and the surplus gains, \$221,290. The proportion of the surplus gains which is applicable to the stock controlled by the National Railway Company is \$189,930, a decrease from 1896 of \$19,163, but an increase over 1895 of \$10,788. The total earnings of the National Railway were 8.45 per cent on its outstanding stock, as against 9.22 in 1896, 8.05 in 1895, 8.85 in 1894, and 9.08 in 1893. During the year \$20,625 was expended for betterments.



SECTION OF CAR FITTED WITH ROUND-CORNER SEAT-END PANELS.

capacity of the car is not decreased. At the same time there are no square corners to catch clothing and bundles on entering or leaving the car, making entrance and egress easier and saving time. Also, the round corners do not form such convenient foot-rests for passengers with muddy boots, neither do they catch and tear the curtains. And the man standing on the running board does not have to bend his body, and can stand erect without holding on. Iron panels have proved to be stronger for wear and in resisting accidents than wood panels, and the rounded form of panel has in addition the advantage that it tends to deflect anything striking it, and at the same time is less liable to catch passing vehicles. It will be noticed in the illustration that the curtain grooves are carried down to the floor, and the curtains can thus be lowered far enough to afford real protection.

This panel has been adopted by the Metropolitan Street Railway Company, of New York, which is a sufficient evidence of their value.

The total number of car-miles run on the company's lines was 12,010,683, and the passengers carried 29,359,515. The passengers carried per car-mile were 1.98 on the cable and 2.77 on the electric lines; the total cost of operating, including interest, was 6.52 cents per car-mile by cable and 8.76 cents by electricity; the total cost to carry each passenger was 4.22 cents by cable and 4.27 cents by electricity.

During the first eight months of the year there was a shrinkage in receipts, but the last four months showed an increase, which still continues. The decrease in the receipts for the year was \$54,298, and the decrease in total expense, \$24,246.

In view of the local conditions existing in '97, the results are very creditable to General Manager McCulloch.

The Cleveland & Chagrin Falls Electric Railroad and the Cleveland, Canton & Southern Railroad are reported as having a lively rate war. The steam road says that it is not to be driven out of business.



## THE REPORT ON THE RELATIONS OF STREET RAILWAYS AND MUNICIPAL CORPORATIONS IN MASSACHUSETTS.

Below will be found the text of the report of the Special Committee on the Relations of Street Railways and Municipal Corporations in Massachusetts. The Committee collected a great deal of valuable data on the street railways in America and abroad which will be added as an appendix as soon as the matter can be properly arranged.

The inquiry the Committee was directed to make proved, when fairly entered upon, far more comprehensive and laborious than was at first anticipated. A vast amount of experience of a most varied character, bearing on what may be termed the street railway problem in its different phases, has, during the last twenty-five years, been accumulated in nearly all portions of the civilized world; but no comprehensive study and comparison of results has been made, nor is there any publication or document, official or otherwise, containing a sufficient body of reliable data. On the general subject there is, it is true, much to be found scattered about in various official reports and investigations, as well as in almost innumerable short treatises, pamphlets and magazine articles; but these, in the comparatively rare instances where a degree of reliance can be placed upon them, have as a rule either been written for a specific purpose and in advocacy of some special theory, or they are of merely local interest. There exists, also, a vast and varied amount of popular misinformation as to results alleged to have been reached elsewhere, more especially in certain European cities. As regards these, indeed, statements are made of a character so wholly misleading that the Committee finally reached the conclusion that it was safe to accept nothing unless verified by examination on the spot; for, even where the facts are in the main as alleged, varying conditions made the conclusions naturally to be inferred from those facts usually deceptive, and almost invariably in greater or less degree inapplicable here.

While, therefore, two members of the Committee devoted themselves to investigations in this country and in Canada, one member went to Europe, there to make such inquiries as might, under the circumstances, be practicable. As respects information, the foreign conditions proved similar to those at home, though, if possible, even more pronounced; at a sufficient cost in time, patience and money, a vast amount of interesting and instructive experience was attainable; but the statistics are even less perfect than in America, and no comprehensive report or official publication exists.

The Committee has no disposition to appear to exaggerate the importance of street railway developments, and the interest felt in them; but as the investigation proceeded it became apparent that not only was the whole civilized world at work on improved municipal transportation, but every considerable town in both hemispheres is acquiring experience of more or less general value in regard to it, while at the same time seeking to learn the results of experience elsewhere. This is more obviously true of material and scientific appliances—cars, motors, inductors and track laying; but in its other and more abstruse aspects the problem is of the utmost hygienic and governmental importance. As a public agency the electric street railway is now fast revolutionizing the character of urban life, spreading it over a wider area and subjecting it to new influences; while entailing, in such items as paving, sewerage and police, a vastly increased municipal expense. Under these circumstances, while there is a widespread call for a comprehensive report on street railways, its preparation implies a very considerable command both of time and money, as well as of governmental machinery. To make such a report of general value, it would, in the judgment of the Committee, be necessary that the person preparing it should be not only in official communication with the whole consular department of the government, but he would himself have to give from a year to eighteen months of time to local examinations, and the comparative verification of the statements which reached him. It is needless to say that neither the time nor the means at the disposal of the Committee sufficed for work of this description. On the other hand, it is distinctly work which might most properly as well as advantageously be made a feature in the next national census, and the Committee proposes at the proper time to call to it the attention of those in charge of that work.

Under the terms of the act ordering the inquiry, it was confined to certain phases of the problem. Limited specifically to what may be termed the franchise relations of street railways and to questions of taxation, it was not to include the mechanical or scientific apparatus in use, the facilities afforded, or, except incidentally, financial and economical results. The present report will, therefore, be devoted to a brief discussion of principles, and a concise presentation of conclusions reached.

Though the street railway is in legislation as well as in the popular mind usually associated with the steam railroad, the two are, in law as well as in mechanics, quite distinct. Both are comparatively recent outgrowths of the tramway, which first came into use in the English mineral regions more than two centuries ago; but, while the railroad was a use of steam power in a new direction, and a pure consequence of the discovery of that power, the street railway was merely an obvious development of the old tram applied to the omnibus route. In its case the process of evolution was, therefore, in the earlier stages quite simple. As the modern municipalities expanded, the demand for better facilities of urban, or, as it would be termed in Europe, intramural, transportation, made itself increasingly felt. Naturally the street car and the tramway at length suggested themselves as convenient agencies—the street car being nothing more nor less than an improved omnibus, and the tramway a special feature in the pavement of the public way; a feature adapted, it is true, to the car's special use, but not necessarily excluding from general use the portion of the street in which it is laid. This is all the street railway was fifty years ago, when first laid; it is all it is now—an improved line of omnibuses, running over a special pavement. If this fact be firmly grasped and borne constantly in mind, the discussion, and the principles underlying it, are greatly simplified. The analogy throughout is with the omnibus line, and not with the railroad train; with the public thoroughfare, and not with the private right of way. Upon this distinction, indeed, all the questions now to be discussed, whether of taxation or of franchise privilege and obligation, will be found to turn.

The economic idea of regulation by means of competition through private ownership was long at the basis of street railway, as of railroad, legislation. Having a strong hold on the public mind, this theory, in the one case as in the other, had, slowly and wastefully, to be outgrown. The motive power in use with the street railway for very many years also underwent no practical change. Steam engines of various descriptions were tried, and, indeed, may still be seen in use in some European cities—notably in Birmingham, England, and Florence, Italy—but their use proved unsatisfactory; while the cable system, though still well adapted to certain conditions of topography and street movement, was too elaborate and costly for general adoption. It was not, therefore, until 1888, or practically within the last ten years, that the development of electricity as a motor introduced a new feature into street railway mechanism, and gave to the system an increased impetus, the far-reaching influences of which have as yet but in part made themselves felt.

The rapid development and increasing importance of the street railway as a public-service agency have meanwhile brought a new class of questions to the front—a class of questions already considered in connection with the supply of water and of gas, but which must now assume a somewhat different aspect. The idea of regulating street railways through competition of lines in private ownership, often for considerable distances of necessity using the same tracks, has by degrees been abandoned. The modern practice, as well as theory, is the consolidation of lines in a given municipality under one ownership, that ownership to be held to strict accountability as a recognized public agency. Through such a system it is believed the most economical results, public as well as private, can be attained—a much longer carriage for the same fare on the one side, and the avoidance of duplicate machinery and organization on the other. Single ownership of some sort, public or private, may therefore be accepted as a condition of the problem. Competition is eliminated from it.

The service to be rendered, and the agency through which it is rendered, involve, however, in this case a peculiar and to a

degree exclusive use of municipal thoroughfares. Not only has a special feature in the pavement to be provided and kept in repair, but the movement of vehicles on that special pavement is such as often to necessitate, through street widening and otherwise, provision of space; for, as the street car cannot turn out of the way of other vehicles, other vehicles must have room provided in which to turn out of the way of the street car. Under existing conditions also the street car is kept in motion by an apparatus of cables or wires—underground or overhead—established for its sole and separate use, and which can neither be duplicated nor used in common by others. When it is added that provision in all these respects has to be made on the surface of the most frequented thoroughfares and principal business streets, the importance and difficulty of the questions sure to arise at once suggest themselves.

The varied experience of the last forty years has already developed, or is now developing, three distinct lines of treatment of the relations between the street railway and the municipality. The first is the natural outcome of the original idea of private ownership of both track and vehicle; the improved omnibus, in other words, runs over a special pavement, laid down by the omnibus company in the public way for its exclusive use. The company owning and operating the line is organized under a State charter, but holds its location in the streets under a municipal permit, usually granted for a fixed term of years, but in Massachusetts perpetual in theory, though in point of fact revocable at any time. This is complete private ownership, and it exists not only in America, but is almost equally well known and recognized in Europe. The second line of development is a recurrence to the original principles of ownership; the street and its pavements belong to the public, the vehicles that run upon the pavements to private parties, whether individuals or corporations. No distinction of ownership or control is under this system recognized between pavements, whether of wood, stone, concrete or iron, or a combination of two of those materials or of all; in any and every case the pavement is laid down and cared for by the municipality, which thus in no way surrenders or compromises its control of its own streets. Having laid, and owning, the pavement, it does, however, concede to a company, on such terms as may have been agreed upon, the exclusive right to run vehicles for a greater or less period of time on a specially prepared part of the pavement. In this case the vehicles and motive power only belong to the private company. The third line of development is in the direction of full public ownership—what is known as municipalization. The analogy of the public water and public gas service is here followed, and both private ownership and private management cease, the municipality running the omnibus as well as controlling the street and owning the pavement. In the course of its investigations the Committee has enjoyed opportunities of studying each system in actual operation, and has heard the merits of each explained by managers and advocates.

In a general way, and subject to limitation and exceptions, it may furthermore be said that, while the first, or private, ownership system is that most commonly in use in America, in Germany the development is in the direction of the second, or mixed, system, and in Great Britain there is a strong and growing tendency towards a thorough trial of the last system, known as municipalization. But whether, in the process of development, the tendency is towards the adoption of one or of another of these three systems, it seems to be recognized everywhere as a fundamental principle that the application of the system is of distinctly municipal or local concernment, the community as a whole having only a broad interest in the principles involved. In other words, in Europe, as in America, the use made of streets and thoroughfares, as well as their care, is essentially a municipal matter. The town or city, whether technically owning the public ways or not, is responsible for them, and, under certain broad general regulations, is free to control and regulate them in such way as it sees fit. The use of the highway for street railway purposes, in Europe, as in Massachusetts, was at first an innovation, and, as such, legal provision had to be made for it; but when that provision was made, either by general law or special enactment, it became largely an extension of municipal, and not of state, functions and control. The officers of the municipality were authorized to permit the occupation of streets for tram or railway purposes under provisions of law; but the control of the municipality over them was subjected to the least possible inter-

ference from without. In passing upon every question which may arise this principle of municipal street control also should be clearly kept in mind. That the street railway, like the thoroughfare it partially occupies, has in many instances outgrown municipal limits, and so become an instrument of interurban travel and communication, is apparent, and this fact also has to be recognized as introducing new elements into the problem; but the fundamental principle of local control is thereby no more destroyed in the case of the railway than in the case of the street itself.

Starting, then, from this basis, the present elaborate street railway system has by degrees been evolved. The whole development has taken place within the last half-century, and vastly the greater portion of it within the last ten years; it has, moreover, been essentially American. That the system now in use, whether in Massachusetts or elsewhere, is in all respects perfect, no one, of course, would maintain; that it is rapidly developing in answer to a public demand is apparent.

So far, however, as Massachusetts is concerned, it may not be out of place here to say that a comparison of systems does not tend to show, either as to practical workings or results accomplished, any grounds for serious criticism. As a working machinery for the daily accommodation of vast numbers of persons, the street railway companies of the Commonwealth fulfill their function quite as well, with as little friction and at as reasonable a cost as any other similar machinery elsewhere which the Committee has had an opportunity to study. On this head, as already intimated, it is not safe to accept loose assertions, no matter how positively made or frequently reiterated, as evidence of what really exists. In every community, persons claiming to speak as authorities are apt to be in evidence declaring that somewhere else, in this case in Baltimore perhaps, or in Toronto, in Glasgow or Birmingham, or in Berlin, an ideal condition of affairs has been reached, in which perfect street railway accommodations, low fares, rapid transit, and contented officials and employes are working in harmony with a thoroughly well-satisfied municipal government, to the expenses of which the railway company contributes a liberal share, while at the same time paying reasonable dividends to its stockholders. The members of the Committee have only to say that, if such a street railway Utopia anywhere exists, they have in the course of their investigations failed to find it. That the street railways of Massachusetts have, as a whole, cost much more than they could now be replaced for, is as indisputable as it has been unavoidable; that in some cases they have been over-capitalized, through questionable processes of financiering, is more than probable; but these, after all, are to a greater or less extent incidents inseparable from an unusually rapid development along new lines and in untried fields.

And this statement at once suggests a consideration of importance, a consideration, in fact, going to the very root of the matter the Committee was appointed to investigate. It is not merely a question of greater or less expenditure, but, if the account is to be correctly balanced, what has been gained through that expenditure, or would have been lost had the expenditure not been incurred, must also be considered. To institute a comparison, for instance, between the street railway transportation of Boston as at present developed and that of Birmingham, of Glasgow or of Berlin, is so absurd as to suggest ignorance. The appliances in use in the European cities named may, and probably do, answer the demands there made upon them; but they pertain to conditions of urban life and of urban movement wholly different from those which now prevail in Massachusetts. A single illustration will suffice. Glasgow has a population of some 800,000, served by 73 miles of tramway, measured as single track; Leeds has some 400,000, served by 27 miles; Boston has nearly 500,000, served by 220 miles. In the neighborhood of 400,000 passengers are each day carried on the Boston street railways, while the combined railways of Glasgow and Leeds, serving a population more than twice as large, carry but 300,000. In other words, with more than five times the population to each mile of street railway track, the number of passengers daily carried in the two cities of Great Britain is only three-fourths of those carried in Boston.

While the Committee was conducting its investigation in Great Britain a sanitary congress, at which some 800 delegates were present, was held in Leeds, one of the cities above referred to.



The eminent medical authority who presided over the sessions of this congress referred in his opening address to the distribution of urban population over a wider area as one of the most crying needs of the day. In regard to it he used the following language: "What is urgently needed in Great Britain today is, firstly, drastic and radical legislation, by which local bodies may be able to acquire land compulsorily, on paying full compensation, for building workmen's houses, and then quick and cheap early travelling, rendering it possible for city workmen to live in the surrounding country."

So far as the work here referred to is concerned, that of distributing urban population over a wider area, with all the results, direct and indirect, therein implied, a most superficial examination will suffice to show that Massachusetts is far in advance of any portion of Europe. This has, too, in large degree been brought about in an extraordinarily short time, not by "drastic, radical legislation," such as that contemplated in Great Britain, but through the rapid and energetic expansion of the street railway system, seen in the comparative statistics just given. That in effecting this expansion much costly experimenting, not always successful, has been paid for, is undeniable; but it remains to be proved that the work, though done through private corporations, either cost them, or through them cost the community, more than from a public point of view it was worth, or a portion even of what it would cost if done in the way suggested at the Leeds Sanitary Congress. This is the other side of the account; and that the work in Massachusetts represented by the items which appear on this side was done in response to a public demand, at once outspoken and urgent, is matter of common knowledge.

One feature in the franchise granted to the Massachusetts companies immediately attracts notice; from the beginning they were, and still almost invariably are, in terms perpetual, while in reality legally revocable at the discretion of local boards. In this respect they are peculiar, almost anomalous; for, as a rule, both in this country and in Europe, concessions have been granted private companies for fixed periods of time only, during which the franchise, or concession, is in the nature of a binding contract. These contracts, especially in European cities, are almost infinite in their variety. They run from periods of fourteen to a hundred years, and, like leases between private parties, are framed so as to provide in advance for every contingency likely to arise. In Massachusetts, on the other hand, the grants of location have, as a rule, been of the simplest possible character, drawn in the most general terms, and with a noticeable absence of technicalities, reservations and safeguards against contingencies; and yet, while by these locations the local boards apparently granted the corporations rights in perpetuity in the public ways, the law, at the same time, reserved to the boards the power to revoke those rights at discretion.

In theory, such a franchise is to the last degree illogical. It can be compared only to a lease, terminable at will by the lessor, and without provision for the compensation of the lessee. Such a system, if suggested, would naturally be pronounced impracticable, if not absurd, and it would be assumed that private capital would never embark in ventures so lacking in the element of permanence and security. Yet in Massachusetts this has not proved to be the case; nor can it be said that the system has, for the half-century it has been in use, worked otherwise than on the whole satisfactorily.

A more fixed tenure of franchises is, however, by the terms of the act creating the Committee, one of the two points it is especially instructed to consider. The substitution for the present indefinite concessions of a specific and binding contract, covering a fixed term of years, setting forth the rights and obligations of the parties thereto and containing a rule of compensation for the purchase of the property in case of failure to renew, at once suggests itself as a measure of reform; and yet, in the course of the protracted hearings before the Committee, it was very noticeable that no such change was advocated by the representatives of the municipalities or of the companies, nor, apparently, did the suggestion of such a change commend itself to either. Some amendments in detail of the existing law, and partial measures of protection against possible orders of sudden, ill-considered or aggressive revocation were suggested; but it was evident that, while the municipalities wanted to retain as a weapon—a sort of

discussion bludgeon—the right of revocation at will, the companies preferred, on the whole, a franchise practically permanent, though never absolutely certain, to a fixed contract tenure for a shorter term, subject to the danger of alteration at every periodic renewal.

It is a generally conceded principle, that in dealing with matters of public policy it is not wise to disturb existing methods, no matter how logical or inconsistent with theory they seem, provided they work reasonably well in practice. The community is accustomed to certain ways of doing business and reaching results; and if the results, looked at as a whole and through a sufficient period of time, are satisfactory, it is questionable wisdom to scrutinize too closely either the logic or the symmetry of the ways in which those results are reached.

The term-franchise, or concession for a fixed contract period, is, moreover, open to serious objections. As the members of the Committee found wherever they studied it in operation, in this country or in Europe, it is apt to operate practically as a check on enterprise, and a bar in the way of any development involving the investment of fresh capital or of earnings which might be divided. The inducement is strong to get the largest profit possible out of the time conceded, without increasing the value of a system a renewed lease of which will at some specified time be under negotiation. This has been markedly the case in Great Britain. The term-franchise has there been universal since 1870, and the rights of the municipalities are so very carefully protected that their best interests have been systematically sacrificed. The municipalities have, in fact, been so afraid they would in some way be out-bargained that they have as a rule rarely overreached themselves; and now, after the lapse of twenty years, they are naturally served by undeveloped lines, with antiquated appliances, simply because they made it the distinct interest of the companies operating those lines to provide nothing better. The Massachusetts franchise, with its terminable-perpetuity feature, may be illogical—it seems, in fact, a contradiction in terms—but it recognizes an ownership under limitations, and the holder of the franchise works with the incentive of gain. It is the familiar case of the free-holder as compared with the leaseholder; and human ingenuity does not seem as yet to have devised any tenure under which men, much less corporations, will develop a business with the same degree of enterprise when they are working for the ultimate advantage of others as when they are working for themselves. Indeed, there is no feature connected with the street railway development of Europe, and especially of Great Britain, as compared with that of America, which is so noticeable as this. The companies are there all in the nature of tenants, or lease-holders, trying to get everything they can out of their concessions during the term for which they hold them. They care nothing for developments of which they are not likely to enjoy the results. In the end, therefore, the community suffers; and it is this sense of loss, and consequent discontent with the situation, which is the chief inducement held out for the experiment of municipalization; although, on the other hand, it is recognized that municipalization may involve an attempt at development on political rather than on business principles. The same thing was noticeable in the American cities visited by the Committee. The term-franchise here, too, has been productive of dissension, poor service, scandals and unhealthy political action. There is probably no possible system productive of only good results and in no respect open to criticism; but, in fairness, the Committee found itself forced to conclude that the Massachusetts franchise, which might perhaps not improperly be termed a tenure during good behavior, would in its practical results compare favorably with any. Certainly those results are as immeasurably as they are undeniably better than the results as yet produced in Great Britain.

While, therefore, the tenure by which the Massachusetts street railways now hold their locations is calculated to excite uneasiness in the minds of security holders, yet that uneasiness is, so far as the public is concerned, not without its compensating advantages in management. Questions involving hardship and litigation may at any time present themselves, and this possibility, there can be no doubt, does stand in the way of the sale of street railway company securities at a price they would otherwise command. The investigations of the Committee have not, however, led its members to believe that the public would derive benefit

from the substitution of any form of term-franchise now in use in place of the prescriptive Massachusetts tenure. But, even if such a substitution were on the whole deemed desirable, it would be intile to propose so radical a change, for existing companies at least, if, while no serious public detriment can be alleged, neither companies nor municipalities appear in advocacy of it. As was apparent at the hearings before the Committee, what the companies desire is a tenure as nearly as possible in perpetuity, with a restricted power of revocation only in the hands of the municipalities; what the municipalities desire is to retain, as a weapon convenient to have at hand, the legal power of revocation at will.

In the course of the hearings before the Committee, attention was called to certain features in the existing law, which, it was urged, might be changed to advantage. On behalf of the general public, it was asserted that, heretofore, concessions of great value had been much too freely granted by those temporarily in charge of the affairs of municipalities; that insufficient franchise obligations had been imposed on the companies; that no provision had been made in the franchises to compel companies to bear their reasonable share of expensive improvements rendered necessary by locations freely given them; that practically no limits had been set to profits, or provision made in case of excessive profits for a division of the same, or a reduction of fares; and, finally, that locations had been, and now occasionally were, made in streets and thoroughfares without any, or without sufficient, regard to the wishes and feelings of residents and property holders thereon.

On the part of the corporations it was alleged that the existing system was defective mainly through the insufficient protection afforded against the arbitrary revocation of locations, and the constant imposition of new and unjustifiable burdens through the threat of such revocation. They claimed, and submitted evidence to show, that the profits of the system were not unduly large, and that the constant changes necessitated by the advance of scientific apparatus, and the demand of the public for new appliances, the best accommodations and the most effective service, were such as to tax to the utmost the resources of the companies, while preventing any accumulation of profits beyond what was necessary for purposes of renewal—if, indeed, proper provision for renewal could now be made.

So far as the greater part of these grounds of complaint is concerned, whether advanced on behalf of the public or by the corporations, and however well founded they may be, they do not, in the judgment of the Committee, call for any considerable changes in the law as it now exists.

The Committee is aware that different views exist on the meaning of the present law. By some it is held that the "restrictions" of street railway locations in the several statutes relating thereto are limited, and that any additional terms exacted or conceded are, in legal phraseology, *ultra vires*, and cannot be enforced in law. This, however, is not the view usually taken, and, confessedly, the practice has been and now is widely at variance with it.\* Such a literal construction of the statute, if sound in law, would result in a noticeable breach in that principle of local self-government which is the basis of the Massachusetts polity. It would, indeed, carry the principle of centralized State control in this matter far beyond the point even, to which it is carried in the countries of continental Europe.

In the view of the Committee, however, the present Massachusetts system, while somewhat undefined and even contradictory in character—as is not infrequently the case with a system built up by degrees as the work of a succession of legislative bodies—tends to treat this whole matter of street railways as one of local

concernment. It is regarded as simply a question of the use which a given municipality sees fit to make of its thoroughfares. The municipalities are held to be the best, and, indeed, within broad limits, the only, judges of that use; just as the railway corporations are the best, and again the only, judges as to the degree of protection afforded by the grants they accept. If municipalities or corporations choose, from over-eagerness or for other reasons, to enter into ill-advised or improvident agreements, which they afterwards repent, that is their affair; and the officials entering into such agreements are responsible to their constituencies, whether the body of citizens or the holders of the company's stock. It certainly is not the part of the Commonwealth either to prescribe the terms of grants, or, after they are made, to examine those terms with a view to seeing that they contain nothing of which the parties to them may thereafter repent. In this view of the matter, it would seem, on the one hand, that improvident concessions of an apparently perpetual character may have been, perhaps were, made by the agents of the municipalities, and valuable privileges were conferred, not complied with corresponding obligations. On the other hand, in their eagerness to secure these valuable concessions and privileges, the corporations may have seen fit to regard the reservation which accompanied them as a mere matter of form. Under the system in use in Massachusetts, it was, as it now is, in the power, as it was and it the duty, of those representing both municipalities and companies to insist on more specific and better-considered grants, covering, if thought best, a given term of years, and binding in law during that term.

Taking this view of the principles of polity and the public and corporate interests involved, the Committee recommends certain changes in the present law, intended to make that law conform more closely to established practice and existing conditions. On the one hand, it would grant the local authorities explicit power hereafter to impose such terms and conditions as they deem the public interests demand, on original grants and locations in the localities over which they have jurisdiction; while, on the other hand, it would protect companies whose tracks have been already located from new and perhaps unreasonable conditions sought to be imposed in grants of alterations and extensions, which may be called for not less for public convenience than by corporate interests. These suggestions are incorporated in the draft of the act herewith submitted.

With the above exceptions, the Committee has seen nothing which would lead it to suppose that any detriment, so far as the public is concerned, has been or is likely to be sustained under the present system, except in one possible contingency. The representatives of the corporations asked that, throughout the Commonwealth, appeal should be allowed from municipal authorities ordering the revocation of a street railway location to the Board of Railroad Commissioners, as is already the rule within the territory served by the West End Street Railway system. (Acts 1887, chapter 413, section 8.) While it is true the revocation of a location may be arbitrarily ordered, not only at a possible serious loss to a railway company, but at no inconsiderable inconvenience to a local public, the local public can generally be trusted in such cases to make its influence felt on its representatives for its own protection. So far as the corporation is concerned, the concessions made to it are general, valuable and unlimited. The corporation might perfectly well have declined to accept the concessions coupled with the power of revocation, and refused to lay its tracks. With a full knowledge of what it was doing, it accepted the location, coupled with the right of revocation; and it is not easy to see on what ground, still holding the location, it can now ask to have the counterbalancing burden of revocation limited, as being liable to abuse, but without being able to instance numerous cases of such abuse, or, indeed, to show that the relations between the municipalities and the street railway companies had, on the whole, or indeed in any respect, been less friendly or productive of fewer good results in Massachusetts than elsewhere.

Cases may, however, at any time arise in which a dispute between a municipality and a corporation, and consequent revocation of the location of the latter, might occasion serious public inconvenience outside of the locality in which the difficulty occurred. It has already been pointed out that street railways are now largely agencies of interurban communication, or travel be-

\*"The law is very simple upon this point. It says that locations may be granted with such restrictions as in the judgment of the selectmen or the aldermen the public interests may require. But these local officials have in practice enlarged the word 'restrictions' so that it is made to include 'terms and conditions' also. To all practical intents and purposes the law might just as well read that locations shall be granted upon such 'terms, conditions, provisions and agreements' as the selectmen may in any case decide." (Argument of E. W. Burdett, counsel for the Massachusetts Street Railway Association, before the Committee, page 103.)



tween towns. The same company not infrequently operates roads in several connecting municipalities. Under these circumstances, it would seem but a fair degree of protection that no outside community should find itself suddenly deprived of its accustomed railway facilities by the removal of rails and wires as the result of a complication in some neighboring town.

An examination of the street railway map of the Commonwealth discloses the fact that such a provision of law would, though nominally limited in its operation, be practically general. All the considerable street railway companies operate routes in two or more cities or towns; and it would be a simple matter for the few smaller companies which now would not come under the protection of such a law to extend their lines so as to bring themselves within it. Such being the case, it has seemed to the Committee better, under the existing condition of street railway development, to establish one general rule for all. A provision to this effect, authorizing the Board of Railroad Commissioners to revise the findings of the local boards, has accordingly been included in the draft of an act herewith submitted.

The allegation that local authorities are in the habit of granting locations in streets against the wishes, or without due regard to the wishes, of residents in such streets, will next be considered. The Committee is not disposed lightly to recommend exceptions to the principle of local self-government. In the great majority of cases the municipal authorities are unquestionably better judges than an outside tribunal of both the wishes and the requirements of those dwelling in a given locality. Nevertheless, cases have arisen, and may again arise, where thoroughfares laid out with great care, and developed at large expense by those dwelling upon them, have been needlessly selected, against the remonstrance of residents, for railway location, when other routes, to the use of which no objection would be made, were almost equally available. Provision to meet such cases seems not to be unreasonable. The Committee, therefore, proposes, and herewith submits in the accompanying draft of an act, a provision that, where a majority in value, or a certain minority in numbers, of those owning real estate immediately abutting on any public thoroughfare protest in writing against the grant of a location for a street railway in such thoroughfare, the location shall be valid only after a hearing before the Board of Railroad Commissioners, and on the approval of that Board.

The extensive and costly street improvements often necessitated by the operation of street cars in the narrow streets of New England towns is a question which was often reverted to in the hearings before the Committee. In order to grant a location in it, a street not infrequently needs first to be widened; for other purposes it is sufficiently wide already. In this case it does not seem reasonable to impose the whole cost of the widening on the municipality. It is true that voluntary contributions have been made by street railway companies for such purposes, but the question may be raised that such contributions are *ultra vires*. Moreover, in cases of original location the proportion of cost which should be borne by the railway company should be clearly within the power of the municipality to determine. If the street railway corporation does not care to accept its location if burdened with such cost, it may refuse it.

A somewhat different situation, though of the same general character, arises when the growth of a community brings about an over-crowded condition of streets. The over-crowding is clearly in part caused by the necessities of the street car service. The widening of such streets is also a distinct benefit to the railway companies. In such cases, also, contributions to cost have heretofore not infrequently been made by railway companies, without any question being raised or intervention of the courts invoked. The technical legality of such transactions is, however, open to question; and it is but natural the companies should, when they can, seek to avail themselves of this point as an excuse for not contributing to a public improvement which they see must be made, but of which they prefer to secure the benefit without helping to bear its cost. Under the construction put upon the existing law, also, contributions by the companies for this purpose cannot be represented by additional issues of capital stock. If made, they must be provided for out of the company's net earnings, and, presumably, at a sacrifice of dividends. While, therefore, it is on the one side not unreasonable to give to the municipalities the right to

assess upon street railway companies, as upon other beneficiaries, a certain proportion of the cost of such improvements, on the other side, the money so expended should be looked upon as part of the cost of construction, and provision made to capitalize it on that basis. The Committee recommends legislation to cure this defect; and has accordingly incorporated in the draft of the act herewith submitted certain provisions from the laws relating to the assessment of betterments.

Reference has been made to the three lines of ultimate development into which the relations of street railway interests and municipalities seem now in this and other countries to be naturally working; that of (1) regulated private ownership; that of (2) the municipal ownership of a permanent way, to be operated by a private company as lessee; and (3) municipalization. The first of these lines of development is that through which the street railway interests of the Commonwealth have grown up, and its advantages and defects are well understood. The chief objection to it is obvious,—it necessarily involves a divided control of streets, resulting in continual jealousies, misapprehensions and disputes. While, because of its apparent simplicity, as well as from the analogy of the steam railroad, it naturally suggested itself in the early and experimental stages of street railway development, it certainly does not now commend itself as a permanent or scientific arrangement. Even should it be continued indefinitely, the Committee is clearly of opinion that it would be conducive to a better state of affairs were the municipalities to assume full control of the streets, meeting all charges for paving, for street cleaning, etc., and receiving therefor from the companies a net annual money payment in lieu of work in kind. This would be in the nature of a commutation,—a pavement and cleaning tax to be paid by the company in consideration of the special provision made in streets for its exclusive use. While clear as to the expediency of this readjustment of burdens, the Committee has had great difficulty in devising a satisfactory basis on which to recommend it. The cost of paving, etc., is included in the accounts of the street railway companies under the general head of "(35) Repair of Roadbed and Track," and the items for paving are not separated from others. On many country roads, also, the obligation to pave is nominal; in city thoroughfares it is heavy; while in other cases the amount of work to be done and expense incurred depend on the terms of particular locations. Again, the cost of removing ice and snow is another obligation which pertains distinctly to the care of streets. The tracks of the street railways are in the nature of sidewalks and footpaths. In winter the public convenience demands that they should be immediately broken out, and kept constantly clear. In the case of the track, as in that of the sidewalk, the snow and ice, when removed, are necessarily thrown, temporarily at least, upon the travelled way. If they cause an obstruction, it is obviously the duty of whoever is legally responsible for the condition of the traveled way to remove them; and for that condition the municipality is, of course, responsible. This has proved a fruitful source of misunderstanding between the companies and the town and city governments ever since the street railway system originated; and the singular spectacle has not infrequently been witnessed of one gang of men, in private employ, shovelling snow from a track, while another gang of men, in public employ, shovelled it immediately back. In this case two propositions seem to the Committee equally clear; first, that it is the business of the city or town to keep its streets properly clear of obstructions, and, secondly, that, under the circumstances, the street railway companies should, in this specific instance, compensate them for so doing. Yet, in the matter of removing ice and snow it is, under the New England climatic conditions, difficult to reach any rule of compensation, the expense actually incurred year by year varies so greatly. In certain years it is nominal, in others it is extremely heavy. Nevertheless, in the opinion of the Committee, some rule should be established.

After a careful study of such data and statistics as could be found bearing on this subject, the Committee has formulated certain provisions in the draft of a proposed act herewith submitted. They establish the legal obligations of the parties, restoring to the municipalities, in so far as may be, the full control of their public ways, and making them solely responsible for the condition of those ways, both as respects pavement and

freedom from obstruction; and, on the other hand, so far as the street railway companies are concerned, the present obligations for labor or pavement work are committed into fixed money payments, in the nature of a tax. While the fairness of this commutation as respects amount, etc., cannot be demonstrated mathematically, it has been reached after careful study of the reports, and is believed to represent approximately existing conditions reduced to an intelligible basis. But, whether it does so, or in some respects fails quite so to do, in its working the benefits will greatly outweigh any possible shortcomings, if it removes from the relations between municipalities and the street railway companies a fruitful cause for ill-feeling, recrimination and arbitrary dealing.

The system of private ownership of street railways, in the shape and to the extent now in use in Massachusetts, is not, however, that which most commends itself, in theory at least, to the judgment of the Committee. A better and more logical system would seem to be that already described, not unknown in Great Britain and elsewhere, but to which the experience of Germany is more especially tending,—a system under which the municipality both owns and controls the whole surface of its streets, whether paved with other material or with iron, and leases to a private company the right to run vehicles over prescribed routes on tracks therein specially provided.

The process through which this result has been, or is now being, brought about in foreign countries is simple and well worth the careful consideration of American municipalities. It is as follows: In the first place, European street railway franchises, or concessions, are never perpetual. They are always granted for a fixed term of years, this term being sometimes established by general law, and sometimes by special governmental authority. The average term is perhaps in the vicinity of twenty years; and the details of the individual concessions made under the general authority are then, as matters of local concernment, worked out in an almost infinite variety of forms,—the result of protracted negotiations between the officials of each municipality and the representatives of a company, or the concessionaires, as they are termed. When this agreement is thus completed, executed and approved by the proper ministerial authority, it constitutes a binding contract, enforceable on both sides during its continuance, and subject to change, termination or extension only by mutual consent, and in the way in it provided.

It is not necessary now to discuss the practical working of this system. It varies greatly under different conditions, depending largely on the traditions, character, political methods and business capacity of communities, but with a continual tendency towards some approved standard. For example, the municipal contracts recently entered into by Berlin and Frankfort, and that are now under consideration in Hamburg, are in Germany regarded as models, and consequently are in the main adopted in other German municipalities.

In the judgment of the Committee, they merit and will repay careful examination, being in curious contrast to the similar contracts entered into in America. As a rule, these foreign concessions are framed with special provision for the ultimate ownership by the municipality of whatever is a part of the streets. In some contracts it is provided that, at the expiration of the term, everything of this sort shall become the property of the municipality, at once and without any payment being made for it, the company during the term of the contract securing itself against loss through a system of amortization; in other cases a measure of compensation is provided, the municipality agreeing to take and pay for the property, in case of inability to agree on a renewal of the concession. In any event, the settled policy is to have everything pertaining to the street and pavement pass into the ownership of the municipality at some not remote future time, leaving the municipality free then to enter into contracts for the operation of the tracks, or to make such other arrangements as it sees fit. But the essential point to which the Committee desires to call attention is the distinction here drawn between the ownership of the pavement, and consequent full control of the street, and the running of the vehicle. The ultimate full control of the street, and exclusive ownership of whatever may be part of its surface, by the municipality, is, it may be said, now accepted in European countries as a fundamental principle of polity.

In the judgment of the Committee, this principle is correct, and could be advantageously incorporated into Massachusetts practice as applying to all street railway companies hereafter organized and locations granted. Even if the concessions in future are not made for a specific term of years, during which they shall be binding contracts to be changed only by mutual consent,—a change the Committee does not advise,—the general law should at least be so modified as to secure in every location hereafter granted a clear, well-considered rule of procedure and compensation, under which the municipalities may, at any time they desire so to do, assume, readily and at an understood and reasonable cost, the ownership of everything appurtenant to their streets.

But it will probably be said that this applies only to franchises hereafter granted,—that Massachusetts is now already well provided with street railways, and that some provision should be made to cover the system already existing. The Committee has given careful consideration to this phase of the problem. Should the question arise on any large scale,—should any particular municipality, for reasons good and sufficient to itself, desire to resume complete control of its streets and pavements, or of any part of them,—the case would, probably, be dealt with individually. The course of procedure would be simple. The municipality would ask of the Legislature a special act, probably framed on the precedents which already exist for the public taking of the property of water or gas light companies, and proceed in the way therein prescribed.

Meanwhile, cases may at times arise in which local communities, in the care of their public ways, might desire to take over certain tracks in particular streets without necessarily taking over all connecting tracks in other streets, or portions even of the same street. The Committee has framed, and herewith submits, a form of act intended to meet such cases. This act, drawn up on principles already laid down, explains itself. It in no wise disturbs, much less provides for the revocation of, any franchise or location of a street railway company. The franchise is treated as a license to run cars over certain routes in cities or towns, for the public convenience. In the case of a street railway such a franchise no more necessarily involves the ownership of tracks than the licenses to run a line of omnibuses involves the ownership of the pavement. If, then, under the proposed act, a municipality takes over the tracks in a certain street or streets, by so doing it in no degree impairs either the right or the duty of any railway corporation holding a franchise to run cars, whether through that street or elsewhere. The tracks specified merely pass into the ownership and care of the municipality, the corporation is compensated for them, and thereafter the cars are run over them, the corporation paying trackage to the municipality. The distinction is the familiar one between the omnibus line run by a private company, and the stone or iron pavement owned by a city or town; except that in this case the company, running its vehicles in exactly the same way as before, pays the city or town for the use of a particular species of pavement laid down for its special and exclusive convenience, instead of itself laying down and owning that pavement. In other words, the essence of the franchise, or location, is the right to run vehicles to carry passengers on certain routes, and the laying and ownership of the tracks is a mere incident, and not an essential incident, thereto. The act proposed deals only with the incident; it in no way affects the essence of the franchise. Under its terms, it will hereafter be in the power of any municipality to retain in its own hands full possession and control of those of its streets in which no street railway location has yet been granted, and then gradually, as occasion offers, to extend that possession and control over other streets in which locations have been granted, until the street railway corporation would by degrees be reduced to its original functions,—those of a private company licensed to run public vehicles over specified routes under fixed regulations, and in consideration of certain rentals and other money payments. It would become, in short, an improved omnibus line, run on scientific principles and adapted to modern conditions.

The third line of development remains to be considered,—that known as municipalization. This has been much discussed of late, and in the hearings before the Committee was advocated by some as the best practical solution of the problem; but even its warmest exponents admit that, as respects street railways,



municipalization is a most important and far-reaching proposition, yet in the experimental stage. The tendency towards it in Great Britain is pronounced, and, as a system in practical operation, it can now be studied in its tentative stage in Glasgow, in Leeds, and in numerous other places. In thus studying it, however, one thought immediately suggests itself to an American. So far as development, activity, and material and scientific appliances and equipment are concerned, apart from permanent way and track surface, the American street railway service is so far in advance of any to be found in Great Britain as not to admit of a comparison. Without exaggeration, it may be said that, while the street surfacing, and merging of track with pavement, are there far in advance of what we ordinarily find in America, all the other appliances and accommodations are either antiquated and positively bad, or recently taken from this side of the Atlantic and installed by American companies. In other words, in the field of scientific apparatus and mechanical development, America has experimented at immense cost, as our street railway capitalization shows, while Europe has patiently waited, and is to-day rapidly and quietly appropriating the results for which we have paid. As respects municipalization, the conditions are likely to be reversed. Foreign countries, and more especially Great Britain, seem disposed to experiment, and experiment on a very considerable scale; and perhaps it would be wise for America to allow these countries in this matter to bear the cost of so doing, sure of our ability at any time to appropriate all the useful results of foreign experience.

As yet no attempt at the municipalization of street railways has been made in any country on a sufficiently large scale and for a long enough time to be of real significance. Glasgow and Leeds, for instance, are the two European instances more frequently referred to. From the statements often met with in the press, and the assertions heard in discussion, it might well be assumed that the experiments made in these cities amounted to an indisputable and established success; whereas, in point of fact, such is in no degree the case\*. So far from being a demonstrated success, it may, on the contrary, be confidently asserted that nowhere, as yet, has the experiment of municipalization of street railways been worked out to any logical and ultimate results whatever, nor can it be so worked out for at least a score of years to come. Even then, political habits, social traditions, and material and economical conditions vary so greatly, and enter to so large an extent into the problem, that it will not be safe to infer that what may have proved safe and practicable in one community is either practicable or safe in another. At the present time, the municipalization of the street railways is not accepted as by any means indisputably desirable in Great Britain, while in Germany it is regarded unfavorably. This last fact is the more noteworthy, as Germany has been the field in which State ownership and management of steam railroads has been developed to the fullest extent, and with results pronounced to be unquestionable, as well as most satisfactory. The grounds for this apparently illogical action and contradictory policy were, during the last summer, briefly set forth to a member of the Committee by the highest German authority. They were purely practical. The State official referred to simply said that Germany had carried officialism as far as, in his judgment, it was prudent to go. The government employes tended always to increase; and there, as here, it was found that employment by the government signified much which did not at once appear. The line had to be drawn somewhere; and it was not considered expedient to add to the number already existing the numerous officials and employes of all the street railway systems in the Empire.

So far as Massachusetts is concerned, the Committee apprehends that grave difficulties of a practical as well as theoretical character would present themselves, should a serious attempt be made at the complete municipalization of street railways. The public ownership of tracks in the streets, like the control of the streets, is a simple matter. Each municipality might own

those in its own streets, or in a portion of its own streets, and a private company could run vehicles over the tracks, whether belonging to itself or to the public, in one or several cities and towns. It would be merely a matter of arrangement and contract. Not so municipal operation. It is necessary again, in this connection, to observe that the larger individual street railway systems are in Massachusetts rarely, if indeed ever, confined to one city or town; the largest of these systems—the West End—holds franchises from and locations in no less than eleven different towns and cities, and the Lynn & Boston in nineteen. Under these circumstances, complete municipalization obviously becomes a difficult problem. It is not supposable that one town or city could own, as well as operate, not only tracks but the buildings and appliances involved in the operation of tracks, in a number of adjacent cities and towns. For instance, complications could hardly fail to arise were the city of Somerville to decide to municipalize its street railways, and operate them as distinct in every respect from the system which served all the adjacent cities and towns; while, on the other hand, it is scarcely probable that Somerville would care to own lines of its own in all those cities and towns, or, if she did, that those cities and towns would regard the scheme with complacency. A community of action through some common organization would, therefore, have first to be devised. Though obviously a necessary preliminary, this, in itself, is an intricate problem, to the solution of which the Committee has not felt called upon to address itself. Should it arise, it will have to be dealt with under conditions not now apparent, and by the Legislature itself. The existing law does not provide for it; nor, in the light of the investigations it has made, is the Committee prepared to suggest any alterations of the law in this respect.

One subject, specially referred to in the act creating the Committee, remains for consideration. The Committee was directed to consider and report whether any uniform system of taxation should be adopted as applying to the street railway companies. This does not specifically raise the question of the disposition to be made of the taxes, already under the existing law collected from the street railway companies in common with all other corporations. That subject has, however, heretofore been considered, and notably by the Boston Rapid Transit Commission of 1891, and the Joint Special Tax Committee of 1892. Both of these bodies, for reasons stated in their reports, recommended an exception to the general rule in the case of street railways, and the payment of the corporation tax levied upon them to the towns in which the companies operated lines, instead of to the towns in which the holders of the stock resided. A bill to this effect was introduced in the Legislature of 1893, passing the House of Representatives by a large majority, but failing in the Senate by a single vote. The considerations in favor of such a disposition of this tax advanced in the two reports referred to commend themselves to the judgment of the Committee, and the change has been incorporated in the form of act herewith submitted.

So far, however, as a further special street railway franchise tax is concerned, grave popular misapprehension seems to exist as to the burdens in the way of taxation to which street railway companies are already subject,—a misapprehension due in no inconsiderable degree to the indirect and anomalous character of those burdens. It seems to be generally assumed that the street railway companies received, and are now receiving, public franchises of unusual value, for which they pay no money consideration and render very inadequate public service; that their profits consequently are inordinately large is also assumed, and that those profits are in some way concealed through a system of vicious financiering and deceptive bookkeeping.

The facts, however, do not seem to be as assumed in this presentation of the case. A more careful investigation fails to disclose those Massachusetts franchises of great value given away without consideration, or unduly large profits on the part of the companies as a whole, or more than exceptional cases of vicious financiering, or a deceptive general system of bookkeeping. There are in all 77 street railway companies in operation in the Commonwealth. Of these, one, the Boston Elevated, or West End, Street Railway, may be left out of consideration, its case being exceptional to such a degree as to make it necessary to put it in a separate class, as has in fact been done through

\*Those seeking further information on this subject are referred to a very interesting, as well as instructive, paper submitted to the committee by Robert P. Porter, superintendent of the United States Census of 1880, printed in the Appendix to this report.

recent legislation (Acts 1897, chapter 500.) Of the 76 remaining active companies, 34 paid no dividends in 1897, while 42 paid dividends of from 1.25 to 10.5 per cent, averaging 4.29 per cent, — a return certainly not excessive. Upon this point the inquiries of the Committee tend to confirm the conclusions of the Board of Railroad Commissioners in their report for 1896 (page 110). While in the business of operating street railways, as in every other business, there are—as, within reasonable limits, there should be—exceptional cases of large profit offsetting cases of failure to earn reasonable profits, yet the idea sometimes entertained that the electric railway is likely to prove a source of extraordinary or abnormal profit must apparently be abandoned. "It is a close business, yielding with skillful and prudent management only a fair average return, quite within the limit allowed by statute and conservative opinion as adequate and proper for investments of this character."

But it is often alleged that the capitalization of the companies is excessive and fictitious, and that, if measured by actual cost, the percentage paid in dividends is deceptive. This is a difficult question to decide; but the laws of Massachusetts as to capitalization have been strictly drawn and rigidly administered, nor has any evidence been adduced showing that they have been peculiarly ineffective. On the contrary, using round numbers only, the capitalization per mile in stock and bonds (\$46,600), is less in Massachusetts than the average (\$49,500) in the New England States, not a third of what it is in New York (\$177,800), or half what it is in Pennsylvania (\$128,200), less than half what it is (\$94,100) in the United States as a whole; and it is less than that in Great Britain (\$47,000), where both construction and appliances are far less costly and elaborate, and over-capitalization has been guarded against with the utmost care. The truth of this allegation in the case of the Massachusetts street railway companies remains, therefore, to be demonstrated, the weight of attainable evidence being distinctly the other way.

The Committee has already discussed what may be termed the special contributions made by the street railway companies to the cost of paving and the removal of snow and ice, and also to their participation in the cost of certain street widenings; and schemes of law are herewith submitted, looking to the better regulation of these matters. The changes therein recommended by the Committee are in main part commutations of burdens already imposed from payment by work to payment in money; the present proposition is of a different nature. It looks to the imposition on street railway companies, of a special franchise tax. The idea of such a tax is not new. The draft of a proposed act providing for one was specially referred for consideration to the large and exceptionally able Rapid Transit Commission of 1892, already referred to.

The Committee concurs in the general conclusions on this subject reached by the Rapid Transit Commission. The system of taxation of corporate franchises in use in Massachusetts is well defined, and, in general, works satisfactorily. All corporations, including street railway corporations, pay to the State their proportionate share of the general taxes according to the market value of their capital stock, which is perhaps the best index of their ability to contribute. The distribution of this tax is a distinct question, and, so far as the street railways are concerned, has already been discussed. Aside from the matter of distribution, there seems to the Committee no sufficient reason to suggest any additional taxation of street railways except in the following particular. It is a well-recognized principle in the treatment of street railway and other public service corporations in Europe, as well as elsewhere, to provide that, after the owners and organizers have received a reasonable return upon their enterprise and investment, any excess of profits over and above a fixed amount should in part be paid to the government in the nature of a franchise tax. This principle commends itself to the Committee. It is not subject to the criticism, which appears to be sound, that a limitation of dividends hampers enterprise and improvement. Where a corporation is not limited in the amount of dividend it may earn, but is simply required to pay over a sum equal to the excess of dividends actually paid over a fixed and reasonable percentage on its capital stock, it will be constantly spurred to render such service that its profits will increase. Being a public service corporation, owned and operated for private profit, it seems just and in accordance with sound

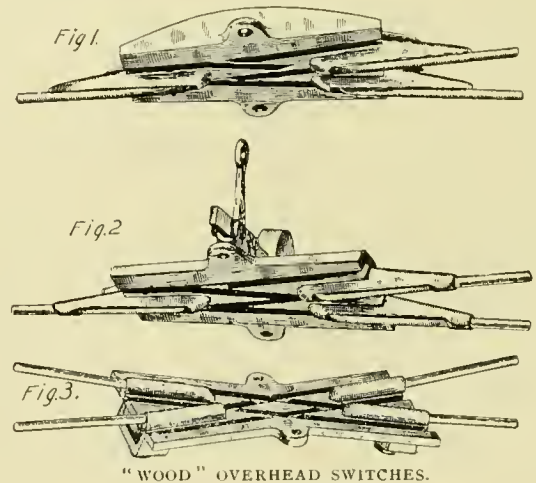
principles that, when the private ownership has received a reasonable return upon its investment, the public should share, through a form of special taxation, in the increment of profit, provided it can do so without the danger of offering an inducement to those in control of the property to stint or conceal their profits. A provision to this effect is incorporated in the draft of the act herewith submitted, similar in its general character to that recommended by the Rapid Transit Commission of 1892. (Report, pages, 119, 124, 281.)

Respectfully submitted,

Charles Francis Adams,  
Wm. W. Crapo,  
Elihu B. Hayes.

## ENGLISH FROGS FOR TROLLEY WIRES.

We find in one of our foreign exchanges descriptions of the frogs for overhead trolley construction which have been designed by W. Wood, chief engineer of the electrical department of the Bristol Tramways Company. It is stated that these frogs and crossings have been adopted on the



"WOOD" OVERHEAD SWITCHES.

electric lines of this company, the ones formerly in use, of American manufacture, being taken down. Fig. 1 is a frog adapted to two lines running into one, Fig. 2 a switch frog with movable tongue, and Fig. 3 the crossing.

## COUNTERFEIT NICKELS.

A considerable number of counterfeit 5-cent pieces have been turned in at the offices of the Ohio street railway companies. They bear the date of 1892, and are so well executed that only a close examination of the reverse side will enable one to distinguish them from the genuine.

## THE INDIANAPOLIS FIGHT.

The latest report as to the progress of the contest between the city of Indianapolis and the Citizens' Street Railroad Company is that the city has won a point. In 1894 a suit was begun to oust the company, on the ground that the charter had expired and the seven years' extension which had been granted was invalid. This complaint was amended a few months since, making the suit one to oust the company in 1901. The railway demurred on the ground that its right in the streets is perpetual. The contention of the city has been sustained in this suit in the circuit court. The case will be carried to the supreme court.



### THE LARGEST RAILWAY GENERATOR.

The 1,600-k. w. generators in the Intramural power house at the World's Fair were considered wonders and almost too big for practical service. Their utility was there demonstrated and later by like installations in the railway power stations in Chicago, Philadelphia, Boston and Brooklyn. But now the Louisville Street Railway Company is to have the giant of them all. This generator, which is to be the largest ever built for traction work, is now under construction at the works of the General Electric Company at Schenectady, and will be installed in the Logan street station in Louisville, Ky.

The capacity of the machine will be 2,400 k. w. or 3,000

### PREPARATIONS FOR THE CONVENTION IN BOSTON.

The executive committee of the American Street Railway Association met in Boston on January 26, to arrange for the annual convention. The members present were President Lang, Secretary Penington, Robert McCulloch, St. Louis; J. A. Riggs, Reading; R. S. Goff, Fall River; H. C. Moore, Trenton. Messrs. Roach, Wyman, Ely and Connetc were unable to attend. The officers and the executive committee have set about the preliminary work with great vigor and will spare no pains to make the coming convention a success in every way.

The convention will be held September 6 to 9, inclusive:



"MECHANICS' BUILDING," BOSTON.

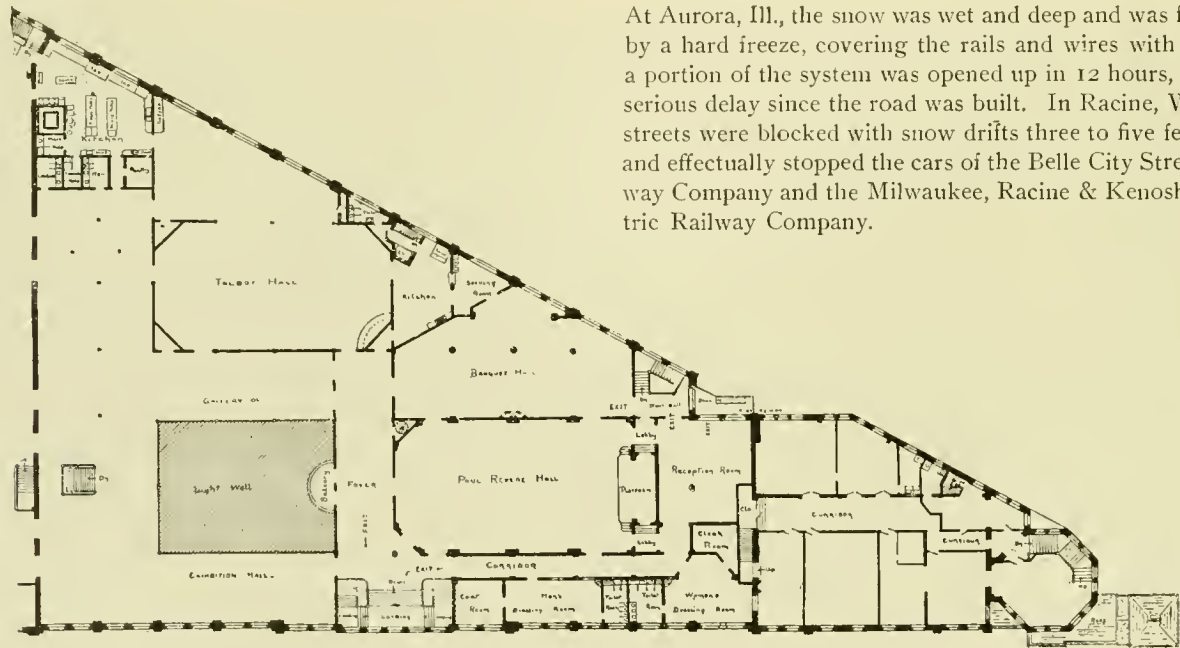
h. p. and will stand an overload of 33 per cent, so that the capacity in cases of emergency may be 3,200 k. w. or 4,000 h. p. The generator will be driven at a speed of 75 r. p. m. by a 4,000-h. p. cross compound engine, to be furnished by the E. P. Allis Company of Milwaukee. The principal dimensions are as follows: diameter of field frame, 19 ft.; width of field frame, 4 ft. 1 in.; 22 poles; diameter of armature, 12 ft. 9 in.; diameter of commutator, 9 ft. 8 in.; diameter of shaft, 27 in.; width of armature, 5 ft.; width of commutator, 21 in.; weight of armature and commutator, 83,000 lbs.; total width of generator, 77 in.; total weight of generator complete, 174,000 lbs. On account of the large diameter the armature can not be transported over the railroads in its completed state, either erect or on its side, and will have to be assembled in Louisville.

this early date was chosen largely because a suitable hall could not be had during October. Accommodations have been secured in the Massachusetts Charitable Mechanics' Association Building, generally known as "Mechanics' Building," located at Huntington avenue and West street, and which is used entirely for exposition and entertainment purposes. The exhibits will be located in two halls, one in the basement, for heavy machinery, cars, trucks, etc., and one on the first floor, for smaller and lighter appliances. The building is adjacent to the freight yards of the Boston & Albany Railroad, and also close to the tracks of the New York, New Haven & Hartford, so that the transportation of the heavy exhibits will be quite easy.

The plan of the second floor, which is here given, shows the location of the meeting rooms of the two associations; the American Association will meet in the "Paul Revere

Hall," and the Accountants' Association in the "Banquet Hall" adjacent to it. That portion of the building shown (the scale is approximately 64 ft. to 1 in.) is, in the first and basement floors, nearly all available for the exhibits; the floor space in the basement exhibit hall is in excess of 25,000 sq. ft., and that on the first floor considerably greater, so that the aggregate is over 60,000 sq. ft. Thus exhibitors will not be so cramped for room as has been the case in the past. The charge for space will be 10 cents per sq. ft.

On one side of the building, towards the railroad, the entrance is at the level of the basement, and on the other the entrance is practically at the level of the first floor; thus there is but one flight of stairs to reach the meeting rooms. The building has its own steam and electric plants, for heating and lighting.



PLAN OF SECOND FLOOR.

The subjects of the papers have been announced for the American Association, but the assignments have not all been made. The subjects are as follows:

"Maintenance and Equipment of Electric Cars."

"To What Extent Should Street Railway Companies Engage in the Amusement Business."

"Underground Electric Roads—Their Construction and Management."

"Carrying of United States Mail on Street Railways."

"Comparative Earnings and Economy of Operation Between Single and Double Truck Cars for City Use."

"How to Care for the Return Current."

"Inspection and Testing of Motors and Car Equipment by Railway Companies."

The entertainment of the Association will be in charge of the Massachusetts Street Railway Association. The plans of the State Association have not been completed, the first meeting having been held the second week in February, but it is understood that a number of entertainments of a kind to be found only in New England will be provided.

After drilling to the depth of 1,200 ft. the Omaha Street Railway Company abandoned the attempt to secure its water supply from artesian wells.

## THE BIG SNOW STORM.

The snow storm which passed over the northern central states the last week in January, was exceptionally trying to the street railway companies, and occasioned large expense and serious delays to traffic. It is estimated that it cost the street railway companies of Chicago \$75,000 to handle the snow. Work was in progress night and day to keep the tracks clear and haul the snow out of the streets. One company alone employed 1,000 men and kept from 100 to 500 teams going constantly until the streets were cleared.

The Milwaukee Electric Railway & Light Company had four plows and seven sweepers and a large force of men working and kept its tracks clean with great difficulty. Some of the railways in the smaller cities were not so successful. At Aurora, Ill., the snow was wet and deep and was followed by a hard freeze, covering the rails and wires with ice, but a portion of the system was opened up in 12 hours, the first serious delay since the road was built. In Racine, Wis., the streets were blocked with snow drifts three to five feet deep, and effectually stopped the cars of the Belle City Street Railway Company and the Milwaukee, Racine & Kenosha Electric Railway Company.

The snow storm in New England and the Atlantic states was no less severe and the railways, especially in the smaller cities, were blockaded with ice and snow. The Consolidated Street Railway Company of Worcester, Mass., had all its snow plows, sweepers and 500 extra men at work clearing its tracks. At first all the lines were blocked, but most of them were opened up on the day following the storm. No trolley lines were reported down. None of the suburban lines about the city were operated and several days elapsed before connections were made with Spencer, Marlboro, and other surrounding towns.

In New York City the conduit lines were delayed but not blocked at any time, and no trouble was experienced with snow and ice in the conduit. The first severe winter test was given to the third rail system of the New York, New Haven & Hartford Railroad. Although the steam trains were delayed for three or four hours, yet the electric trains were operated constantly with only a few seconds delay in the schedule. The snow completely covered the tracks and the third rails, but there was no perceptible leakage. This was considered a severe and successful test of the system.

In Boston, the storm, which was a genuine old-time "nor'easter," was the most severe in years. Snow fell to a depth of 20 in., and snow and sleet and wind combined to



wreck many pole lines. The trolley lines resumed operation earlier than the steam roads, some of which did not get their suburban service going for 48 hours. At one time the Boston Street Railway Company (West End road) had as many as 7,500 men at work. As high as 40 cents an hour was paid owing to the enormous amount of immediate work required. The storm cost the surface lines in the city \$250,000, besides loss of traffic.

While the writer was in the office of a western street railway manager, a few days after the storm a committee of property owners called to demand the removal of all the snow which had been piled in high banks on each side of the street. They were highly indignant and not as polite in their demands as the occasion warranted. The manager listened patiently until each had had his say, and finally, when there came a lull in the storm, greatly surprised his auditors by agreeing fully with them that the company ought to haul away the snow. The only point in question, he declared, was the amount of the company's share. Then he produced a diagram of the street and showed that allowing for the space from tracks to curb, what had been shovelled from sidewalks and thrown down from roofs, that the road had actually contributed just one-fifth to the snow banks. Then he closed the interview with a promise to remove his portion—one block for each four blocks they removed, and a request to advise him when they started in, and his teams would be ordered out at once. They departed in silence and as we go to press had not yet tackled their four-fifths of the proposition.

### PEDESTRIANS MUST TAKE CARE.

The supreme court of Iowa has recently rendered a decision affirming the old rule that pedestrians must "look and listen" before crossing railway tracks. The case was an action at law brought by Beem, administrator, against the Tama & Toledo Electric Railway & Light Company, to recover for the death of his intestate. The decedent was 71 years old and quite deaf, who walked upon the railway track and was struck by a freight car pushed by a motor car. Had he looked he could have seen the approaching train for a distance of 550 feet. After the evidence was in the lower court directed the jury to bring in a verdict for the company. The plaintiff appealed. In affirming the judgment below the court said in part:

"The grade of the railway descended from the crest of a ridge and although the evidence as to the speed of the train is not satisfactory, it may be conceded that the jury would have been justified in finding that it was greater than the ordinance permitted and that accident was due in part to negligence on the part of the defendant. It remains to be determined whether the jury would have been authorized to find that the decedent was free from negligence which contributed to the accident.

"It is true, as contended by the appellant, that it is the duty of persons in charge of a street car to be watchful and diligent to avoid doing injury to others, but persons who cross street railway tracks also have duties to perform. They cannot assume that without care on their part they will be seen and protected from harm and the car stopped if necessary to avoid a collision. They are not as a rule required to use the same degree of care as would be required if they were about to cross an ordinary commercial railway track. But street cars are operated according to established time schedules and their efficiency and value to the public demands that they be so operated. To require whenever a person approaches the track that they be stopped or their speed be slackened until it is evident that the

person will not be endangered by the running of the cars, would be to impose a serious and in many cases an intolerable burden upon the railway corporation and to subject its patrons to annoying and injurious delays without any substantial reason for so doing or benefit of importance to any one. Ordinarily a pedestrian who approaches a street railway track may and does without appreciable effort or loss of time ascertain if a car be near and it is his duty to do so.

"The only conclusion which can be reasonably drawn from the evidence in this case is that the decedent did not take any precaution to avoid the accident. Although he was unable to hear readily and therefore should have been more diligent to discover the approach of the train by the sense of sight, he could not have looked in the direction of the car when about to cross the track. There is no room for the presumption which arises in some cases that the natural instincts of the decedent led him to use reasonable care to avoid the accident. The evidence clearly shows that he could not have done so without avoiding it. It may be, although it is not shown, that the employe in charge of the train saw the deceased while he was walking near the track, but if so the employe had no reason to suppose that the decedent would turn towards and attempt to cross the track without looking for and avoiding the train. Until there was reasonable ground for concluding that he might do so the employe had the right to rely upon the presumption that he would exercise the caution which a person of ordinary prudence would have exercised. It is not shown that when the decedent turned toward the railway track to cross it that the car could have been stopped to avoid the collision. On the contrary, it is clear that the car could not then have been stopped before it occurred. We conclude that the evidence could not have authorized a recovery by the plaintiff, and this verdict was therefore properly directed for the defendant."

### W. R. GARTON.

W. R. Garton, who has been so long and favorably known in the street railway business, has established an office at 414 Ashland Block, Chicago, and will devote his attentions to consulting engineer's work. Mr. Garton's experience in



W. R. GARTON.

the street railway line has been a diversified one; starting 12 years ago as a conductor, he has been successively motorman, inspector, electrician, superintendent and general manager. During the past three and one-half years his time has been taken up with the commercial phase of the business. He was recently elected general manager of the Garton-Daniels Electric Company, and is a director and consulting engineer of the Raster Carbon Rheostat Company. Besides representing these firms Mr. Garton will be the western agent of several large eastern manufacturing companies, particularly those in the street railway field, but also some of those handling other leading industrial products. Mr. Garton's well known ability and energy guarantee success in his new undertaking.

The City & Suburban Railway Company, Portland, Ore., has leased the 2nd street line and is engaged in reducing the gage from standard to 3 ft. 6 in., which is the ordinary gage for street railways in Portland.

DEATH OF JOHN S. PUGH.

Few of the many salesmen in the street railway field had so large an acquaintance, or numbered so many of those acquaintances as friends, as John S. Pugh; and it was with a feeling of sorrow and surprise that the news of his sudden death was received.



JOHN S. PUGH.

He was born in New York City, November 7, 1858, and in 1872 entered the service of the John Stephenson Company, with which his father, D. W. Pugh, has been connected for so many years. In 1885 he became a member of the firm of Pugh & Russell, in the manufacture and sale of street railway supplies, and which later be-

came the selling agents for the John Stephenson Company. The firm was dissolved in 1889 and Mr. Pugh became associated with the Baltimore Car Wheel Company; leaving this concern in 1894 to become the general sales agent of Dorner & Dutton, of Cleveland. A year later he again represented the John Stephenson Company.

He was taken ill while on the road, and returned to his home in New Rochelle, N. Y., where he died suddenly of hemorrhage of the brain. He was a grandson of the late John Stephenson, and leaves a wife and three little daughters.

Mr. Pugh was a man who readily made friends, was successful and conscientious in his work, and a man of large heart and generous impulses.

TROLLEY COMPETITION IN MASSACHUSETTS.

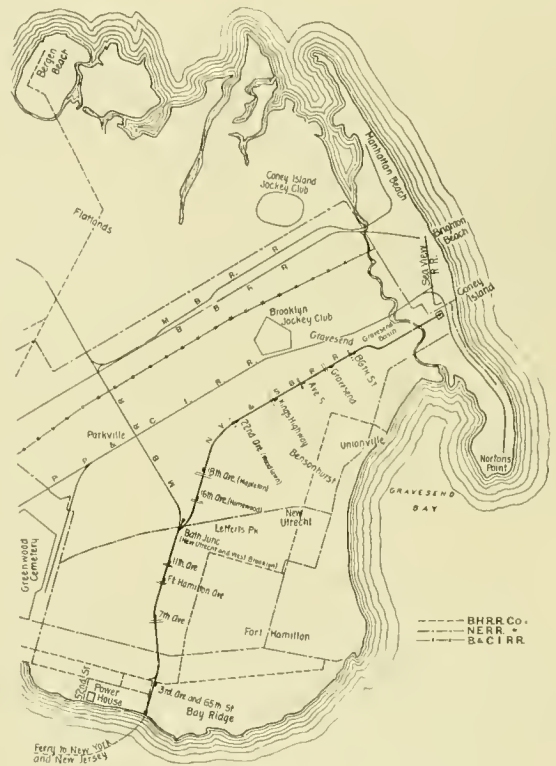
The decrease in the number of passengers carried by the steam roads in Massachusetts, and especially on those roads which run into Boston, has been very marked since 1893. For the 10 years up to and including 1893 there was an average increase in the steam road passengers of nearly 5,825,000 per year. In the four years since then there has been an average decrease of over 4,766,000 passengers a year; the total number carried in 1893 was 121,807,945, and in 1897, 102,743,890. In the same period the number of passengers carried on the West End Street Railway has increased at the rate of 9,672,700 per year, an increase of 29 per cent for the four years. The total for this and the four other roads running into or in Boston has increased at the rate of 12,208,000 per year, which is 31.1 per cent for the four years.

WHEELS WILL RIDE IN BROOKLYN.

The Brooklyn City & Newtown Street Railway Company has equipped two of its cars with hangers for carrying bicycles on the front and rear dashboards, with the view of determining whether the facilities thus afforded will be taken advantage of by cyclists. If experience shows that the convenience is sufficiently appreciated all the cars of the company will be provided with the hangers when the season is farther advanced.

NEW ELECTRIC LINE TO CONEY ISLAND.

The New York & Sea Beach Railroad, as announced in our December issue, has passed under the control of the Brooklyn Rapid Transit Company, which purchased a majority of the stock and bonds. The Sea Beach road extends from the foot of 65th street (Bay Ridge), Brooklyn, to Coney Island, a distance of six miles, and the object of the Rapid Transit Company in securing the line was to give a frequent and high-speed service to Coney Island from all



MAP OF LINES TO CONEY ISLAND.

parts of Brooklyn for a 5-cent fare. The only changes necessary were to put up overhead wires and bond the rails. Horseshoe bonds were used for this purpose. Motive power will be obtained from the South Brooklyn plant of the Brooklyn Heights road.

The accompanying map from the Railroad Gazette shows the several lines running to Coney Island; the three electric lines are those of the Brooklyn Heights Railroad, the Nassau Electric Railroad and the Coney Island & Brooklyn Railroad.

For through service from Fulton Ferry, Hamilton Ferry, South Ferry and the Bridge, connections have been made with the Brooklyn Heights road at 65th street and 3rd avenue; from other lines transfers are made at this point.

PROPOSED ELEVATED FOR CHICAGO.

The Chicago City Railway Transit Company was incorporated February 9, by parties connected with the Chicago City Railway. It is stated that the new company proposes to build an elevated road extending north from 30th street, in Dearborn street and Plymouth Place, with a down-town loop, for the better accommodation of the far southern and southwestern traffic of the Chicago City Railway.





38-FT. CAR—ATLANTA RAILWAY COMPANY.

### NOVEL TRUCKS AT ATLANTA.

We illustrate herewith a car, and its truck and motor equipment, built at the shops of the Atlanta Railway Company, Atlanta, Ga., after the designs of Frank M. Zimmerman, superintendent of the company. Though these are the first trucks that have been built the idea is not new with Mr. Zimmerman, he having had it in mind for some years past.

The car is 38 ft. long, 11 ft. 6 in. high and 7 ft. wide, and has a seating capacity for 60 people. The total weight is about 9 tons. The floor is 33 in. above the rail. From center to center the two trucks are 22 ft. 6 in. apart.

The construction of the truck is well shown in the illustrations. The wheels are 30 in. in diameter and the wheel base is only 32 in. The motor case which constitutes the truck frame is of cast iron. The motors, one on each truck, have four poles and are rated at 35 h. p. each. The motor is geared to both axles, the gear ratio being  $3\frac{1}{4}$  to 1. The weight of each truck is 7,500 lbs. The short wheel base enables the truck to turn between the sills, and both axles being driven all the weight of the car is available for traction.

This car has been in service for six months and has given the best of satisfaction.

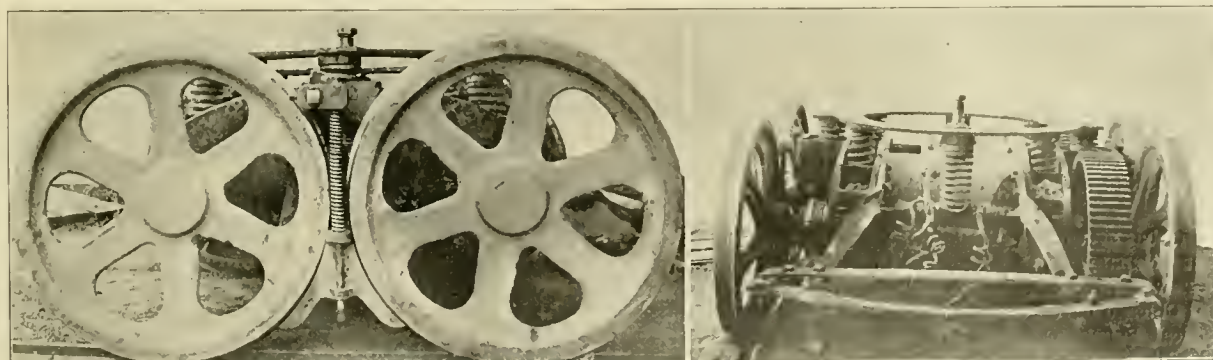
Mr. Zimmerman's experience began with the old Sprague

Company, later he went with the Westinghouse Company and was with that company when it first entered the street railway field. He afterwards entered the employ of the Detroit Electrical Works, having charge of the equipment of the Detroit Citizens' Street Railway Company's lines. After the completion of some of the lines he accepted the position of superintendent of motive power, and remained in that capacity, doing all the electrical engineering, until August, 1895, when he resigned and went south to take the position he now holds with the Atlanta Railway Company.

### NO CONDUCTORS IN WINONA.

The street railway business in Winona, Minn., has not been on a paying basis, and the railway company was confronted with the alternative of shutting up shop or reducing expenses by discharging the conductors. It has decided to try the latter plan and fare boxes have been placed in the cars. The motorman alone is in charge of the car.

The Beaver Valley Traction Company, Beaver Falls, Pa., has leased a tract of 60 acres at the northern terminus of its line and will convert it into a handsome park and picnic grounds at a cost of about \$15,000.



SIDE AND END VIEWS OF TRUCK.

## PERSONAL.

A. F. Schoch has resigned as director and treasurer of the Ottawa (Canada) Electric Railway Company.

Robert Gillman, of Kansas City, has been elected a member of the Institution of Civil Engineers of Great Britain.

Alfred Wallace has resigned his position as superintendent of the Columbia (S. C.) Electric Street Railway, Light & Power Company.

F. S. Given has assumed the management of the Pennsylvania Traction Company which operates the street railways of Lancaster, Pa.

Edward Berry Kittle of the Sprague Electric Company, New York, was a "Review" caller while in Chicago on a few days' business trip.

I. W. Miller, superintendent of the Wilmington (Del.) & New Castle Electric Railway, has resigned to accept a similar position with the new road at Olean, N. Y.

F. S. Pearson, chief engineer of the Metropolitan Traction Company, of New York, has resigned because of ill health and will go to the south of France for a long rest.

Herman W. Falk, president of the Falk Manufacturing Company, has taken his family for an extended European trip on which he will combine business with pleasure.

H. T. Walter has declined a re-election as secretary of the Chester (Pa.) Traction Company, and accepted a position with the Staten Island Midland Railroad Company.

F. H. Fowler, of Springfield, Mass., late of the Bemis Car Box Company, has been appointed superintendent of the Washington & Great Falls Electric Railway Company.

Robert H. Dick has been appointed superintendent of the Wyandotte & Detroit River Railway to succeed John Busby who was recently made superintendent of the Detroit & Pontiac.

A. B. Skelding, general manager of the Wilmington (N. C.) Street Railway Company was recently married to Miss Clara Dorothy Ames, daughter of Rev. John G. Ames, of Washington, D. C.

G. Howard Duvall, who was for some time with the Baltimore, Middle River & Sparrow's Point Railroad, as secretary and treasurer, is now with the Chloride of Silver Dry Cell Battery Company, of Baltimore.

Henry Holgate has resigned the management of the Montreal Park & Island Railway, having accepted the position of general manager of the West India Electric Railway Company which is now building a line at Kingston, Jamaica.

W. E. Baker, superintendent of the Metropolitan West Side Elevated, of Chicago, responded to the toast "Intramural Transportation in Relation to Real Estate Values" at the 15th annual banquet of the Chicago real estate board.

F. S. Terry has accepted a position with the Western Electrical Instrument Company and has removed to Newark, N. J., to assume his new duties. Mr. Terry's abilities in the electrical industries of Chicago have long been known. His connection with the Electrical Supply Company, the Ansonia Electrical Company and with the Sunbeam Lamp Company have given him a wide experience in that line. We feel assured that success will attend him in his new field of work.

O. L. Stanton, who has been superintendent of the Ft. Wayne (Ind.) Street Railway Company since the spring of 1896, has severed his connection with the company. Mr. Stanton was successful in his management and deservedly popular with the employes under him.

Lemuel J. Coburn, recently connected with the supply house of Smith & Wallace, Boston, has resigned to give his entire attention to the New Orange Industrial Association, of New Orange, N. J. Mr. Coburn will make headquarters at 50 Market street, Poughkeepsie, N. Y.

Gus. Suckow, general manager of the Vose Car Spring Company, has returned from an extended trip and advises that business is excellent. Mr. Suckow has been with the Vose Company for 21 years, during which time he has become an authority on the manufacture of springs.

J. W. McFarland, formerly of Savannah, Ga., has been appointed superintendent of the Chattanooga Electric Railway Company. Mr. McFarland has been connected with electric railways since 1888, and with electric lighting plants since 1880, and the company is to be congratulated on having secured his services.

George Albert Cragin was married to Miss Minnie Cornwell Wilson on Thursday, January 20, at St. Louis. Mr. Cragin is the general representative of the Washburn & Moen Manufacturing Company in the south with headquarters at Houston, Tex., and was formerly in charge of the San Francisco office. During his business career, which has been a very successful one, he has made a host of friends in the street railway fraternity who will join us in wishing a bright future for him and his bride.

Augustine W. Wright, one of the best known and most successful street railway engineers in the country, has accepted the presidency of the American Railway Construction Company, of this city, and will give it his personal attention. Mr. Wright has had 30 years' experience in engineering work in horse, cable and electric railway construction, and during that time has put in 5,000,000 cu. ft. of concrete work, of which his company will make a specialty. With Mr. Wright are associated E. F. Cary, as vice-president, and Chester D. Wright as secretary. The high standing and ability of this company to carry out contracts of the largest character, is well known; at the same time less important undertakings will receive the same careful attention and be executed with the same fidelity. The office of the company is at 1203 Monadnock block, Chicago.

## OBITUARY.

Burr K. Field, vice-president of the Berlin Iron Bridge Company, died suddenly after a brief illness. He was born in May, 1856, and was graduated in 1877 from Yale University, where he had pursued the course in civil engineering. He was first connected with the Northern Pacific Railroad and in 1883 accepted a position with the Berlin Bridge Company. His services were valuable to this company and his promotion was rapid.

## FLOOD IN SOUTH BUFFALO.

During January there were heavy rains in the east which broke up the ice in rivers and creeks and resulted in disastrous floods in many places. South Buffalo in particular was a heavy sufferer, the Buffalo river and Cazenovia creek overflowing and submerging a large district in the vicinity of Cazenovia Park. Many of the street railway tracks were flooded and the regular cars were replaced by the company's snow plows which hauled open cars as trailers. In several places the water would come above the floors of the open cars.



## AN ELECTRIC FREIGHT LINE IN SWITZERLAND.

An electric railway, extending from Chavornay  $2\frac{1}{2}$  miles to Orbe in the canton of Vaud, was opened for freight and passenger service in the autumn of 1894. It was built to give railway facilities to Orbe, a town of 1,884 inhabitants, and make connection with the Jura-Simplon Railroad at Chavornay, a village of 800 population. The track was made standard gage so that the cars can be switched direct from the steam road to the electric line. The freight traffic consists chiefly in carrying provisions, coal, building material and agricultural produce. The map, Fig. 1., shows

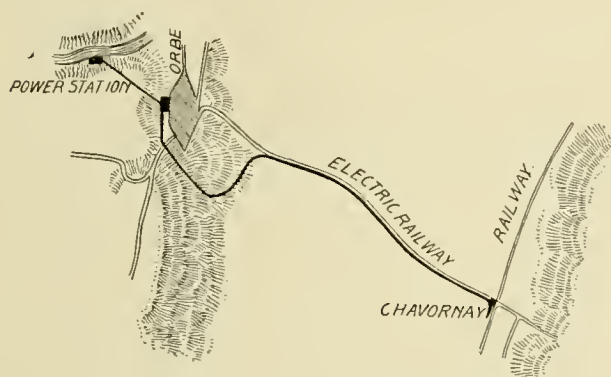


FIG. 1.—CHAVORNAY-ORBE LINE.

the route of the railway which for  $1\frac{3}{4}$  miles follows the public road.

The current is supplied from a water power station situated a half mile west of the town on the river Orbe. There is an average fall of 33 ft. which furnishes 260 h. p. There are two 80-h. p. turbines belt connected to two 6-pole, 45-k. w., 600-volt generators. In the day time the surplus power from these machines is used to drive small motors in the town and for lighting purposes at night.

The trolley line is a  $\frac{1}{4}$ -in. steel wire but this is supplemented by a copper feed wire of the same diameter. The trolley wire is suspended from iron brackets on wooden poles which are spaced 100 ft. apart. The track is laid with

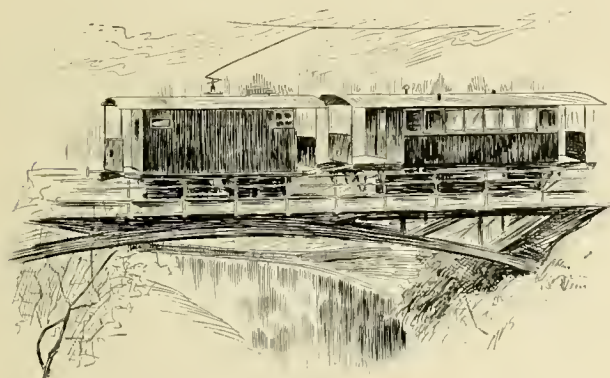


FIG. 2.

40-lb. rails with steel ties spaced 3 ft. Instead of a trolley wheel a sliding contact shoe is employed. These shoes wear very rapidly and have to be renewed every few weeks. There

are two passenger motor cars, one trailer and one motor car for freight service. The cars are each 20 ft. in length, 7 ft. 2 in. in width with a wheel base 7 ft. 6 in. One of the passenger motor cars, Fig. 2, has a compartment for mail and small parcels. It will seat 20 passengers and carry three tons of parcels. The other cars have a capacity for 45 passengers, and the remaining motor car, Fig. 3, can carry five tons of freight. The cars are heated by coal in the winter time. Each car with load weighs 15 tons. There are two 6-pole 30-h. p. motors under each car and these give a speed of nine miles an hour.

The daily schedule conforms with the arrival of trains on the railway at Chavornay which necessitates 11 round

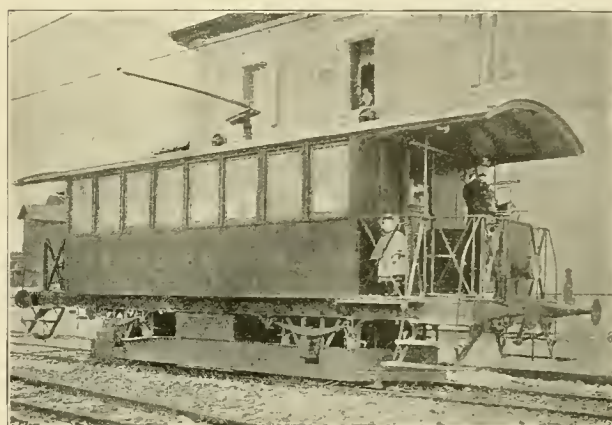


FIG. 3.—MOTOR CAR.

trips daily. In Engineering, London, C. S. Du Riche Preller gives an account of the traffic and receipts. The first year after its opening the road carried 53,128 passengers, 106 tons of parcels, 2,488 tons of freight which, with the mail service, afforded a revenue of \$5,390. There were 21,600 train-miles run. The expense was divided as follows: Administration, .6 cent; maintenance, 1.2 cents; traffic, 5.8 cents; wages, 7.6 cents, and general charges, 2.2 cents, making a total of 17.4 cents per train-mile. There was a profit in the operation of \$1,475, which was a return of 2 per cent on the money invested.

## ABOUT TOWER WAGONS.

A most important part of the equipment of any road is the tower wagon. The time lost with makeshifts, to say nothing of the annoyance, inconvenience and danger, would in a few months pay for a first-class wagon. The Trenton trolley wagon has been adopted by the leading roads of this and foreign countries as the standard. Four years of hard usage have proved it to be a most convenient, reliable and thoroughly practical wagon, and it receives the highest praise from all who are using it. McCardell, West & Co., of Trenton, N. J., are the patentees and sole manufacturers.

The Toledo, Monroe & Monroe Beach line is being handled by Holt, Schober & Co., Hale building, Toledo. The line touches several popular beach resorts on the lake from which boats run to Put in Bay, Kelly Island, etc., and is one of the links in the road between Toledo and Detroit.

## FOREIGN FACTS.

A tramway is to be built at Lous le Saunier, France.

The electric railway at Elbeuf, France, is fast approaching completion.

Power to operate the street railway is sought of Parliament by the corporation of Newcastle, Eng.

Fred. Spencer, of Walsall, Eng., has been appointed general manager of the Halifax Corporation Tramways.

Edinburgh has concluded negotiations for the purchase of the Portobello section of the street railway for £40,000.

Dumdee, Scotland, is promoting a bill for the municipal ownership of the street railways and their equipment with electricity.

Electrical equipment will be placed on three miles of double and single line at Newport, Eng., at an estimated cost of £30,000.

La Société des Tramway Electriques de Gand has been formed in Ghent, Belgium, to acquire the horse lines and equip with electricity.

Siemens Bros. & Co. have received a contract to build eight 60-passenger cars for the corporation of Blackburn, Eng. The price is £5,444.

Although the scheme was vetoed, the London United Tramways Company has not given up its plan to construct electric lines in the Ealing District.

The New Zealand Light & Traction Company has been formed at London to acquire concessions in New Zealand. Registered by Paine's & Co., 14 St. Helens Place, London, E. C.

Proposals will be received until March 15 by the Stadtische Verkehrsdeputation, Rathaus III, Berlin, Germany, for the construction of several electric railways in that city.

Having completed the purchase of the street car lines, the council of Nottingham, Eng., is considering which form of mechanical traction to adopt, with a leaning toward electricity.

Bids are invited by the Corporation of St. Helens, Eng., for the supply of engines, generators, battery, trolley wire, poles and other street railway material. Tenders should reach W. J. Jeeves, Clerk, Town Hall, St. Helens, by February 21.

The new electric railway at Alexandria, Egypt, is of standard gage, with Broca rails weighing 88.5 lbs. per yard. No trailers are used, there being ten motor cars for the 7.5 miles of road, each equipped with two 25-h. p. motors. The cars are of the convertible type and are divided into first, second and ladies' class.

The New Cross & Waterloo Railway Company has been formed at London to build an underground electric road from a point in Old Kent Road to a point under Waterloo Road near the crossing of the South Eastern Railway. Capital stock, £975,000; directors, James Heath, M. P.; Robert Arthur Read, and Thomas S. Soden.

The Japan Weekly Mail reports that the Tokyo Street Railway will assume a definite form after Mr. Nomura, expert of the Bureau, returns from his inspection tour through Europe and America. The promoters of the Ina Electric Railway met some time ago in Hamacho, Nihonbashi-ku, to hear the report of an expert, Dengoro Ushioda, on their plans.

The Great Northern & City Railway Company has a bill in Parliament applying for power to extend its line and purchase land for a generating station. The Metropolitan Railway Company of London asks Parliament to grant power to equip all its lines with electricity and to acquire lands on which to erect a generating station.

Brown, Boveri & Co. are about to equip the standard gage railway between Burgdorf and Thun, Canton Bern, Switzerland, with their three-phase transmission, so successful at Lugano. The same firm has completed the entire electrical equipment of the railway up the Gorner Grat, near Zermatt, also employing three-phase transmission.

The Electric Street Car Manufacturing Syndicate has been registered at London with power to acquire certain patents of Thomas H. and Thomas Parker and the London Electric Omnibus Company. The capital stock is £25,000; and the directors are S. Craddock, Thomas Parker, Edward Lisle, Major Flood-Page and T. H. Parker.

The Hastings, Bexhill & District Light Railways Company, the Bournemouth, Poole & District Light Railways Company, and the Finchley District Electric Traction Company have been registered to build, equip and operate light electric railways in Sussex, Hants and Middlesex, respectively. In each case the capital stock is £10,000, and the registrar J. B. Glenn, 7 Poultry, London, E. C.

Buenos Ayres, South America, and the port of La Plata are to be connected by an electric railway, W. R. Cassels and John MacGee having applied to the government for a franchise. Mr. Cassels also asks a concession for an elevated electric railway from Plaza Colon to Casa Amarilla, thence to Calle Caseros and the Southern Railway station. The electrical energy would be supplied by the River Plate Electric Light & Traction Company. A. Pareus & Co. propose to construct and operate a system of electrical railways in the city.

The British Thomson-Houston Company states that several other tramway lines in England are inclined to follow the example of the Dover Corporation Tramways by adopting wattmeters for their cars. These meters are of the Thomson-Houston make and have a capacity of 25 amperes, guaranteed to register correctly 50 per cent overload for short periods. The armature and clockwork of the meter are placed on sensitive springs to take the vibrations of the car, and so far the meters have worked satisfactorily. The cost is about \$50 per meter.

## A NEW SITE WANTED.

The Jewett Car & Planing Mill Company, of Jewett, O., purchased its present plant about five months ago for manufacturing street cars of all kinds. A. H. Sisson, W. H. Lorentz and C. E. Krebs, three young business men of Wheeling, are back of the company, and it is due to their efforts that the firm has been so prosperous. Within two weeks of the date of purchase an order was secured and the orders now in hand will keep the plant running for some time. Owing to the limited capacity the traveling men have been temporarily recalled. The buildings are inadequate for the needs, and the company is seeking a new site, correspondence being carried on with several towns with this end in view. An order for cars has just been completed for the Charlestown Traction Company, and work is progressing on a large one for the St. Louis, Belleville & Suburban Railway Company. Recently the services of Niel Paulson, who has a wide acquaintance among street railway men, have been secured, and he will be superintendent of the car department.



## ECHOES FROM THE TRADE

The J. G. Brill Company reports sales of 500 of its double trucks from January 1, 1898, to January 20.

The Q. & C. Company has just issued a handsome catalog of its car door equipment and general railway specialties; it is called "Catalog C and D."

The J. G. Brill Company has just issued a pamphlet describing the new round-corner seat-end panel, which the company is putting on its latest open cars.

We have received from the Peckham Truck Company a large wall calendar for 1898, which shows the different types of Peckham trucks for single and double truck cars, snow plows, etc.

George F. Card, of the Card Electric Company, succeeds F. A. Rogers as general manager. The company has lately been receiving some very encouraging orders with good prospects for the year's business.

Frederick K. Stearns, Edwin J. Booth and David Meginnity, of Detroit, have organized the Michigan Contracting Company, Limited, and will engage in construction and equipping of steam and electric railways.

The Taunton Locomotive Manufacturing Company has received an unusually large number of orders for snow plows. It has already sold 49 plows this year which surpasses the number sold during any previous season.

The Egan Company, of Cincinnati, has just shipped 12 car loads of woodworking machinery for the Russian government. This is one of the largest of such exports ever made and speaks well for the enterprise of the concern.

William S. Turner, consulting and constructing mechanical and electrical engineer, has removed from No. 1 Nassau street to 120 Liberty street, New York, and will carry on as heretofore his engineering and constructing business.

Hirsch Bros. & Co., Chicago, advise us that contractors Orman & Croak, of Pueblo, started on the work of construction of the Canon City & Cripple Creek Electric Railway, with an increased force which now aggregates 1,000 men.

Alonzo G. Collins, 608 Pabst building, Milwaukee, is laying out a steam plant for one of the large manufacturing concerns in Wisconsin, which will include compound condensing engines, mechanical draft and other features conducive to economical operation.

The Central Electric Company is carrying complete stocks of "Insulac" and "Armamac" for the insulation of generators, motors and all kinds of high potential work. These two compounds are fast establishing a reputation for permanency and absolute reliability.

The Sterling Supply & Manufacturing Company, 145 East 25th street, New York, reports that the month of January was the busiest of any month since the company has been in business; it has been obliged to hire a great many new men and work the full capacity of the shop.

The partnership lately existing between John C. Dolph and Franz E. Triacca under the firm name of J. C. Dolph & Co., doing business in the city of New York, was dissolved by mutual consent on January 24. By consent, Mr. Triacca has been authorized to liquidate the business.

"The Pierrot calendar," which has been sent to its friends by the Vose Spring Company is one of the most tasteful calendars that we have ever seen. It is in the form of a crescent, upon which are attractive figures of children, the monthly calendars being on stars surrounding the crescent.

On January 26 the Jackson & Sharp Company shipped five sleeping cars and 27 electric cars which complete the large contract which the company had recently received from Buenos Ayres, Argentina. During the past year the foreign trade of this company, and especially in South America, has been very gratifying.

The R. D. Nuttall Company reports a very gratifying increase in business during the month of January, with prospects for a large trade. There is a very considerable increase in the demand for standard trolleys, many roads taking advantage of the liberal trade offers to dispose of old types and equip with the latest designs.

The illustrated catalog of the Skeen Electric Switch & Signal Company, St. Louis, is a pamphlet describing the automatic block signals for street railways, and includes a copy of the standard rules that govern the operation of single track roads when so equipped. The catalog will be sent to all who desire it, on application.

The General Equipment Company, 1011 Chestnut street, Philadelphia, which represents, in Pennsylvania, New Jersey, Maryland and Delaware, the Keystone electrical instruments, Dornier & Dutton gears, and other lines of street railway supplies, has recently sent to each of the managers in its territory a neat file case for price lists and circulars.

Westinghouse, Church, Kerr & Co. have removed the auditing department from New York to the Pittsburg office. This change made it necessary for W. L. Murray, the auditor, and his associate, G. W. Kimball, to make their homes permanently in Pittsburg, and a farewell dinner was given by the employees of the company in their honor.

J. A. Fay & Co., Cincinnati, received orders for 26 of the 30 machines, contracts for which were recently awarded by the John Stephenson Company for the equipment of the new car shops of the latter company at Elizabeth, N. J. Other recent orders were for the woodworking machinery for the car shops at Sormova, Siberia, and Psever, Russia.

"The Baragwanath Condenser" is the title of an illustrated pamphlet recently issued by Wm. Baragwanath & Son, 48-52 West Division street, Chicago. This condenser is of the inspirator jet type and was illustrated in the "Review" for December, in connection with the description of a 1,000-h. p. cooling tower. It is of course applicable to any purpose for which a vacuum is required.

The Electric Railway Equipment Company, Cincinnati, the operation of whose works it was feared might have to shut down temporarily on account of the unusually high water in the Ohio river, is glad to report that the danger has passed and there will be no delay in filling the large number of orders which have been pouring in during the past few months. At present there is greater likelihood of being flooded with business than with water.

The Garton-Daniels Electric Company, Keokuk, Ia., reports the best kind of business, and although this is the season of the year when it does not look for large orders, as much work is now going through the factory as in the busy summer months.

of 1895 and 1896. The demand from foreign countries has been, and continues, especially good, and everything points to a very extensive demand for the Garton arresters during the coming summer and spring.

Bibber, White & Co., 49 Federal street, Boston, have established a railway department under the management of Herbert W. Smith, formerly of the firm of Smith & Wentworth, dealers in street railway supplies in Boston. Mr. Smith, from his former extensive experience, is well qualified to take up the duties of his new position. A complete line of street railway supplies will be handled by this department, and the company is now manufacturing several new designs of hangers and other line material.

In a recent issue of American Trade, the organ of the National Association of Manufacturers of the United States, we note a request that the members and all other manufacturers interested in the South American markets, send catalogs, circulars and price lists of their goods to the sample warehouse of the Association at Caracas, Venezuela. We have previously mentioned this sample warehouse at Caracas, which affords an opportunity to exhibit samples of American goods at the minimum of expense to the exhibitor.

C. E. Barrett, who was formerly with the Missouri Car & Foundry Company, and who has had charge of the car-seat business of Hale & Kilburn, Philadelphia, for the last four years, has been appointed contracting agent of the Barney & Smith Car Company, of Dayton, O., and in this connection will push the sale of the Wheeler car seat manufactured by this company. This seat is already considered standard on many prominent railroads. Mr. Barrett is well and favorably known to the trade and we predict success for him.

On January 18, A. S. Littlefield announced that he had severed his connection with the American Railway Construction Company of which, ever since its organization, he has had the full direction, and had organized the North-American Railway Construction Company. Mr. Littlefield is president of the new company and Emmet M. Fry is general superintendent. The company will make a specialty of building electric railways and do a general contracting business, and has secured a crops of competent assistants with that end in view.

We have received from the Cambria Iron Company, Philadelphia, a copy of the new book of rail sections, which the company has just issued. It is entitled "Cambria Steel Rails. Vol. II, Girder Rails, etc., for Street and Electric Use." It comprises full size sections of the rails rolled especially for street and electric roads, sections of splice bars, an illustrated catalog of the Cambria tie plates, and a table of useful information relating to track material. The company will be very glad to send a copy to parties in the street railway business who desire to have it.

The New York & Staten Island Electric Company, in February, 1897, contracted for the installation of about 1,200 h. p. of the Cahall-Babcock & Wilcox type of boilers in its power station, which then contained some boilers made by the Babcock & Wilcox Company of New York. The company shortly doubled this order and now (just about a year later) has given the Cahall people not only a third order but also a contract to dismantle the boilers in the power station made by the Babcock & Wilcox Company, and rebuild them into the Cahall-Babcock & Wilcox type.

The Swarts Metal Refining Co., Chicago, requests us to make the following announcement: "Will you kindly mention in the next issue of your paper that we are not in any way connected with the Swarts Iron & Metal Company, which recently sold out its business? We are entirely on different lines, and have at no time had any connection with that company. The name being somewhat similar to ours, caused some confusion amongst the trade. We take this means of notifying the trade that we are still doing business at the old stand and are ready to fill any orders that may be entrusted to us."

The number of arc lamps, manufactured and shipped from the factories of the General Electric Company within the past fiscal year, has exceeded 24,000. There are thousands of the enclosed arc type now in service, and the introduction of the alternating enclosed lamp has still further increased the sales. There is also a constantly increasing demand for incandescent lamps. This is due in part to the waning popularity of the Welsbach burner, for the expense involved in renewing shattered mantles has proven excessive. These are rapidly being replaced by incandescent lights, and in stores, hotels and halls, where the Welsbach burner secured a temporary success, enclosed arc lamps are now in use.

We have received a catalog of high pressure air and hydraulic fittings and flanges prepared for the Tight Joint Company, by John Platt, of Thorpe, Platt & Co., engineers and agents, 97 Cedar street, New York. The book contains a description of the special fittings and gives tables showing the size of flanges for 750 and 1,500 lbs. pressure per sq. in. Part II. contains information for use in designing hydraulic plants, and includes matter that is of considerable value to those who have to design and use hydraulic machines. The information on rivetting, forging and flanging is worked up from experiments made in the shops. The formula for flanging dies, by T. R. Browne, will be found of value to all manufacturers using flanging presses.

South Canal street, Chicago, boasts of some of the finest machinery stores in the world. Railroad tracks running directly in the rear of the buildings make it a particularly favorable location, on account of being able to receive goods directly from the cars to the stores.

Probably the largest of these stores is that of J. A. Fay & Egan Co., located at numbers 22, 24 and 26, they being there for the convenience of customers located in northern Illinois, Wisconsin, Minnesota, Colorado, Iowa and Nevada. A full line of both J. A. Fay & Co., and Egan Company machinery is carried there, so that parties residing in this territory should, to save time, write direct to Chicago, the store there being an integral part of J. A. Fay & Egan Co. of Cincinnati.

Maurice Coster, the successful manager of the Chicago office of the Westinghouse Electric & Manufacturing Company, has a large territory at his command and is most vigorously looking after the interests of his company. His territory includes Michigan and Indiana to the Ohio river on the east, and a belt stretching west to the Rocky Mountain states. The increasing business of his office has necessitated recent additions to his staff, the latest of whom is Walter H. Whiteside, recently with the Gates Iron Works, of this city, where he was in charge of the high speed engine department. Mr. Whiteside has a large acquaintance and a wide experience, and in natural ability and previous business connections is especially fitted for the duties of his new connection, in which, with his friends, the "Review" wishes him deserved success.

The Hoppes Manufacturing Company, of Springfield, O., manufacturer of the live steam feed-water purifiers and exhaust steam feed-water heaters, reports large orders recently received through the Philadelphia office, as follows: The New York Sugar Refining Company, Long Island City, three special live steam purifiers aggregating 3,750 h. p., and three exhaust heaters of 4,500 h. p. capacity; the Union Traction Company, Philadelphia, 3,000 h. p. of special live steam purifiers for high pressure. The Springfield office reports sales as follows: Deering Harvester Company, Chicago, 2,500 h. p. of live steam purifiers; repeat order from the Proctor & Gamble Company, Ivorydale, O., 1,000-h. p. purifier; Louis Sands, Manistee, Mich., 1,000-h. p. purifier; Thomas & Smith for the Chicago Public Library, four special live steam purifiers of 300 h. p. each.

E. F. de Witt & Co. report that the demand for their "common sense" sand box has been good all through the hard times and the prospect for a brisk business for 1898 is very promising. A large order has lately been received from Europe through their foreign agents, the Peckham Motor Truck & Wheel



**MAYER & ENGLUND,****10 SOUTH TENTH ST. PHILADELPHIA, PA.****Electric Railway Material and Supplies  
OF EVERY DESCRIPTION.***We carry a Large and Complete Stock of Everything needed for the Construction,  
Equipment and Maintenance of Electric Railroads.***HIGHEST CLASS MATERIAL AT LOWEST PRICES.****NUTTALL GEARS, PINIONS AND BEARINGS.****UNION STANDARD TROLLEYS AND PARTS.****PARTRIDGE SELF-LUBRICATING CARBONS.****INTERNATIONAL REGISTERS AND REGISTER FITTINGS.****VAN WAGONER & WILLIAMS CO. COMMUTATOR SEGMENTS.****COMMUTATORS REFILLED. ASSEMBLED BARS AND MICA.****ELECTRIC HEADLIGHTS. ELECTRIC CAR HEATERS.****MOTOR AND CONTROLLER REPAIRS, ALL KINDS.****STANDARD OVERHEAD MATERIAL.****Prompt Shipments from Stock. Send for Catalogues.**

Company. Many fine testimonials have been received, among them one from the Chicago General Railway Company says: "That the 'common sense' sand box has been in operation on our cars for the past four years, and is giving better service than any sand box I know of." The Utica (N. Y.) Belt Line Railroad Company writes: "We are pleased to be able to state that we have experimented at different times with several different sand boxes for motor cars, and have concluded that the de Witt 'common sense' sand box for every day practical use is the best sand box we have ever had an opportunity to use."

In an editorial on the progress of tramways in Great Britain, the London "Electrician" has this to say about cast welded rails: "Nevertheless, electric traction construction shows no sign of crystallisation, for newer methods and improved details of plant are continually being introduced. Perhaps the most interesting illustration of this is the decision of the New General Traction Company to depart from the custom hitherto universal in this country of mechanically jointing and bonding tramway rails, and to adopt, in the new lines about to be equipped at Coventry and at Norwich, the Falk system of cast-welding rail-joints, which has proved so successful at Chicago and in other parts of the United States. British tramway engineers, whether directly interested in electric traction or only indirectly, will watch closely the process of acclimatisation of cast-welding in this country. Probably, on the whole, our fickle climate will prove less trying to the cast-welded joint than the great extremes of temperature it has had to withstand in the climate of some parts of America."

A. W. Atterbury, secretary of the Detroit Steel & Spring Company, in a recent conversation, said to our representative:

"I am always interested in reading your 'Echoes from the Trade,' as they are indications of the general condition of business throughout the different sections of the country. As you know, we are not only large producers of all kinds of engine and car springs, but have extensive rolling mills and a fair sized plant for the manufacture of steel castings. While our trade is

large among the steam railroads and street railways, we have a large trade among the agricultural implement makers, carriage and wagon makers, engine builders, dredge builders and various manufacturers who use bar steel and steel castings. In all of our departments since September, we have been running day and night and orders are booked ahead for several months to come. From the fact that we supply a number of different lines of manufacture, and in each line trade has been unusually large, we feel that our increased trade shows conclusively the general improvement and prosperity of the country. While the volume of business has been extensive, prices have not advanced materially. Collections have been excellent. We believe that 1898 will prove to be a satisfactory year to all manufacturers."

The Sargent Company, of Chicago, reports a very large business in railway supplies during the past few weeks, and advises us that orders for the new "Diamond S" shoe are coming in rapidly. This shoe, it will be remembered, was fully described in our columns in a recent issue. It is manufactured of cast iron with an insert of expanded steel, giving great friction and long life to the shoe, without injury to the tire. Tests have been made on a large number of railroads with uniform satisfaction, the result of which is shown by the large number of orders received. W. D. Sargent, the vice-president and general manager of the Sargent Company, has just returned from England and the Continent, where he has been engaged in introducing the "Diamond S" brake shoe. Notwithstanding the proverbial conservatism of foreign railway managers for American inventions, the merits of the shoe are so clear, that several of the railroads in England are already using them, and the prospect for a large extension of this business is most flattering. The Sargent Company has recently published the second volume in the series on the "Diamond S" brake shoe, giving the results of the tests of this shoe, which were conducted on the brake shoe testing machine at the shops of the Westinghouse Air Brake Company, at Wilmersburg, Pa. The company will be pleased to furnish copies of these pamphlets together with results of service tests to all railroad men, upon request.



**Interesting Bits of Information from all Parts of the Country,  
Boiled Down for Busy Readers.**

Slippery rails caused a collision between a cable train and an electric car on the West Side lines, Chicago, February 1, which resulted in slight injuries to two persons.

A dead infant was found in a bundle left in one of the cars on the elevated road in Kansas City; later it was claimed by a physician, who gave a satisfactory account of it.

The directors of the Chattanooga Electric Railway Company were re-elected at the annual meeting of the stockholders. The board re-elected J. H. Warner president and E. D. Lilly secretary.

The Metropolitan Street Railway Company, of Kansas City, Mo., will install in its Riverview power station a new 2,000-h. p. unit, the machinery being an exact duplicate of that already in place.

The assessment made by the city of Elizabeth, N. J., against the Consolidated Traction Company has been reduced nearly 25 per cent by the state board of taxation in order to allow for the depreciation.

One of the linemen of the Augusta (Ga.) Railway & Electric Company cut some of the guy wires while at the top of a 30-ft. pole. The pole fell to the ground, crushing the man beneath it, but his injuries did not prove fatal.

The changing of the line of the Metropolitan Street Railway Company, New York, to the conduit system is proceeding rapidly. It is expected that within seven months only some of the minor cross town lines will be operated by horses.

The rumor is again afloat that the Chicago, Milwaukee & St. Paul road will soon ask the city council for permission to substitute trolley for steam on its suburban line, Chicago to Evanston, a distance of 12 miles. Officials decline to discuss the matter.

At the petition of one of the stockholders of the Delaware (O.) Electric Street Railway Company the court removed J. D. Van Deman, who had been appointed receiver, and named John A. Cone in his place. The objection urged against Mr. Van Deman was that he was a stockholder.

Notwithstanding that the company has done all in its power to comply with the vestibule law in the limited time allowed, the prosecuting attorney has commenced proceedings against General Manager W. T. Van Brunt of the St. Joseph (Mo.) Street Railway Company, and the case will be heard at the next term of the Criminal Court.

J. A. McElroy, of New York city, is now on his way to Glasgow to supervise the construction of some of the street

railway work in progress in that city. Mr. McElroy is also interested in a third rail system which he expects to introduce in England.

A bill has been introduced in the New York Assembly which provides that the elevated railroads shall not use any portion of their property for the purpose of advertising the business of any other corporation or person, nor for the sale of any goods except newspapers and periodicals.

During January, 1898, the gross earnings of the system of the Brooklyn Rapid Transit Company were \$414,809, an increase of \$22,524 over the corresponding month last year. For the seven months ending January 31, 1898, the earnings amounted to \$3,220,150, as compared with \$3,129,563 for the same time last year.

The Ottawa (Ill.) Street Railway Company was on January 20 placed in the hands of a receiver, as money to pay for the improvements made during the last summer was not forthcoming, and it was desired to place the road under the protection of the court. Local papers say that the citizens of the town do not support the road by their patronage, as they should.

The controlling interest of the Forest Park Highlands Amusement Company is held by G. W. Baumhoff, L. A. Thompson and other street railway men in St. Louis. Connections are made to the park from seven lines, the new ones being the Olive street, Leclde and Market street lines. An electric fountain and other attractions will be ready for this coming summer.

At a meeting of the stockholders, bondholders and receivers of the Fox River Electric Railway Company, Green Bay, Wis., which was placed in the hands of receivers a few weeks since, a plan of reorganization was adopted. C. L. Goodrich, of Toledo, was chosen superintendent, and C. H. Holmes, the former president, will have charge of the clerical and office force.

That portion of the line of the Union Traction Company, the Anderson-Marion (Ind.) road, which is already in operation, that is, the nine miles between Anderson and Alexandria, has proved to be a paying one, and has greatly cut down the passenger receipts on the Big Four Railroad between those points. In the spring a truck car for the accommodation of farmers will be put in service.

The stockholders of the Wissahickon (Pa.) Electric Railway at the annual meeting voted to accept the proposition to lease the line to the Roxborough, Chestnut Hill & Norristown Traction Company for a term of 999 years with compensation as follows: Two per cent on \$150,000 each year for two years; 3 per cent for the next six years; 4 per cent for the next seven, and 5 per cent thereafter.

The majority of the stock of the Newport (R. I.) Street Railway Company has passed into the hands of the Newport Illuminating Company, which is controlled by the Vanderbilts and other wealthy men having summer residences in the city. At one time they were opposed to the building of the line, but it will now be operated as hereto-



fore, but no extensions will be made into the fashionable portions of the city.

While a heavily loaded motor car and trailer were ascending a steep hill near the Capitol building in Denver one of the motor bearings became overheated and set fire to the oil and waste. The flames soon fired the car floor and caused a prompt exit of the passengers. The whole interior burst into flames and the fire department was summoned. The trailer was uncoupled and run out of danger, but the motor car was badly damaged.

The report of the South Side Elevated, Chicago, for the 11 months of 1897 after the reorganization shows the surplus from the operation to be \$121,943; after deducting interest for six months at 4 1-2 per cent on bonds outstanding and at present charged to the construction account, the net income is \$105,068, or about 1 per cent on the stock. Until the opening of the Union Loop the traffic by months was from 1 to 27 per cent less than for the corresponding month in 1896.

The Union Traction Company, Philadelphia, recently secured an injunction against a firm of machinery dealers and the teamster who had the hauling contract, restraining them from moving a large iron tank through the city over a route which was occupied in part by the line of the street railway. It would have required five hours to transport the tank, and during that time traffic on the railway would have been blocked; there was also danger of pulling down the overhead work.

The annual report of the Columbus (O.) Street Railway Company, of which W. F. Kelly is general manager, shows that the property has been well managed during the past year. There were carried 13,284,530 passengers and 3,514,545 car-miles run. The total receipts were \$605,921 and the operating expenses 47.3 per cent of this, divided as follows: Maintenance of way, .6 cent per car-mile; maintenance of equipment, .7 cent; conducting transportation, 4.6 cents; power, .7 cent; general expenses, 1.3 cents, making a total of 7.9 cents.

In the case of the People's Railway Company against the Grand Avenue Railway Company, of St. Louis, regarding the joint use of tracks, a decision has been handed down ordering the Grand Avenue Company to pay the People's Company an annual rental of \$2,284, 75 per cent of the cost of repairing the tracks, costs in appealing the suit, and furnish a bond of \$10,000 as a guarantee. The People's Company is required to repair all switches and connections, keep watchmen at necessary points and pay costs of the special commissionership proceedings.

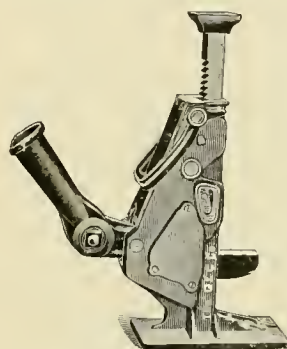
The operation of the Tuscarawas Electric Railway between Canal Dover and Uhrichsville, O., has greatly diminished the traffic on the Cleveland, Lorain & Wheeling Railroad. To meet this competition the railroad has reduced the rates and put in service four additional fast trains each way daily. It is expected that the trolley line will make reductions to hold its patronage. The question is a rather trying one just now, as C. E. Mitchener, vice-president and superintendent, is in the far west and his daughter is attending to his duties as superintendent.

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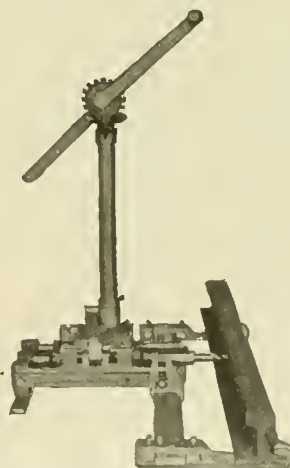
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# The Q. & C. Company,

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### FIRE IN MAINE.

On January 16 the Casino at Willard Beach, South Portland, which was the property of the Portland & Cape Elizabeth Railway Company, was destroyed by fire. A pavilion and restaurant were also burned. The Casino was built in the spring of 1896 at a cost of \$31,000 and contained an orchestration valued at \$3,500; the insurance amounted to \$27,000. The other losses amounted to \$4,000, partly insured. The origin of the fire is unknown.

### THE Q & C BUY THE STANWOOD STEP.

The Q & C Company, manufacturers of railway specialties, portable rail saws, track jacks, rail drills for both street and steam railways, have purchased the entire stock of the Stanwood Manufacturing Company and will continue the manufacture of the popular steel car step which is now in use on about 200 street railways, as well as on government vessels, etc. All inquiries or orders for these goods should be addressed to this company. These goods will hereafter be known as the Q & C Stanwood Car Step, and they will be made at the large and commodious factory of the Q & C Company, located 27 miles from Chicago on the C. & E. I. Railway, at Chicago Heights, Ill.; the general offices of this company being at 700-709 Western Union building, Chicago.

The Stanwood step, which is self cleaning, has been very popular with all managers who have used it, being light and very strong and extremely durable.

Press dispatches state that Tom L. Johnson has sold his stock, some 6,000 shares, in the Cleveland Electric Railway Company.

A. Groetzing & Son, Allegheny, Pa., state that the trade in "Dermaglutine" pinions continues very active. The general line of goods has been giving universal satisfaction.

W. H. Wilkinson has resigned his position as general manager of the Diamond Truck Company, and returned to the Peckham Motor Truck & Wheel Company, with which he was formerly connected. Mr. Wilkinson will have the position of assistant superintendent to Mr. Uebelacker. The increased business of the Peckham Company has necessitated additional force, and as Mr. Wilkinson was for several years connected with the concern as superintendent, his experience and ability render him a valuable addition. The company is unusually busy for this season. Among the large orders now being filled are 100 maximum traction trucks for Middleboro, England; 150 standard trucks for Dublin, and 60 extra long for Omaha.

### NEW PUBLICATIONS.

Lippincott's for February maintains the well known high standard of that popular publication. The leading story is by Captain Charles King, U. S. A., whose writings always find a responsive chord in the hearts of thousands. The other articles and stories are on timely topics, by competent and entertaining writers.

Munn & Co., New York, have just issued their new reference catalog of the Scientific American Supplement, which gives an elaborate index of over 10,000 important articles which have appeared in that periodical. The present edition is of a more convenient size than former ones. The catalog will be furnished free on application.

The Walker Company, of Cleveland, O., has recently published two instructive circulars, one being a paper by Prof. S. H. Short on "Electricity as a Motive Power on Elevated Railways," fully illustrated and accompanied by curves and tables, and the other is a short dissertation on "Mica Insulation," with three illustrations.

"The Motor Engineer's and Electrical Workers' Handbook," is a pocket manual for motor engineers and street railway men, compiled by William Lintern, of West Park, O., with the view of furnishing a book of reference in a simple and convenient form. It includes diagrams of machine and controller connections and the methods of testing for faults. Morocco, \$1; cloth, 50 cents.

The New York Switch & Crossing Company, Hoboken, N. J., has just issued a new catalog of "Railway Supplies," a handsome book of 40 pages illustrating the rail sections, fish plates, etc., which are now considered standard in street railway work, the special work for frogs, crossings and switches manufactured by the company, and the automatic electric switch known as the "Dividend Saver."

"Introductory Course in Mechanical Drawing," is the title of a book of 120 pages just issued from the press of Harper & Brothers. The author is J. C. Tracy, C. E., instructor in the Sheffield Scientific School of Yale University; E. H. Lockwood, M. E., of the same School has written the chapter on perspective. The plan of the work comprises two distinct but parallel courses of graded exercises, for either of which 90 or 100 hours is required. Following the statement of the problems are eight chapters treating of the principles involved in the different methods of projection used in mechanical drawing, and of the instruments and the methods of using them. The chapter on perspective in particular will be found very useful to draftsmen who wish to get in a concise form the rules and principles of the subject. The book is illustrated with 163 figures and 8 plates.

### NEWS NOTES.

ATCHISON, KAN.—The Atchison Railway, Light & Power Company, which recently took possession of all the property of the Atchison Gas, Electric Light & Power Company, is making arrangements to consolidate the power plants. A new car house 40x130 ft. will be built. This house will contain a machine shop.

BALTIMORE, MD.—Permission to lay tracks on the Fishhawk road has been granted to the Consolidated Railway.

BALTIMORE, MD.—Franchises for additional lines have been granted to the Consolidated Railway Company. Right to lay tracks on Caton avenue has been granted to the Baltimore, Halethorpe & St. Denis Railway Company.

BINGHAMTON, N. Y.—The Binghamton Railroad Company will add a new dynamo and necessary appliances, also a 250-h. p. McIntosh & Seymour engine. The company has secured the necessary franchises and right of way for a 6-mile interurban extension, but it is very doubtful if construction be attempted the coming season.

BIRMINGHAM, ALA.—J. B. McClary, general manager of the Birmingham Railway & Electric Company, is in the market for the following station equipment: One 750-h. p. horizontal, simple corliss engine, 90 r. p. m., to be direct connected to a 500-k. w. generator; two 500-h. p. simple corliss engines, 80 r. p. m., to be belted to two 300-k. w. generators; one 500-k. w., 500-volt, direct connected generator, capable of delivering an overload of 40 per cent and to overcompound 10 per cent at full load; fourteen return tubular boilers, 72 in. x 16 ft., each containing 91 4-in. tubes, for 120 lbs. pressure; and two pumps of 10,000 gals. per hour capacity. The Birmingham Railway & Electric Company will build two miles of sidings on suburban lines, using 40-lb. T rail.





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**CORRESPONDENCE.**

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

**DOES THE MANAGER WANT ANYTHING?**

If you contemplate the purchase of any supply or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that supply. We make no charge for publishing such notices in our DAILY BULLETIN.

This paper is a member of the Chicago Trade Press Association.

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The Chicago Electrical Association is to be congratulated upon the step it has taken in adopting a standard system of conventional diagrams of electrical apparatus which is designed to secure uniformity in electrical engineering and patent drawings. The adoption of the diagrams chosen by its committee after the most careful consideration of those in use, by a recognized body places a standard of uniformity before the general public, and will have, it is hoped, the final result of making such diagrams clear and uniform and save much trouble and time in seeking printed explanations of drawings.

In an open letter to the public during a discussion of the relation of speed to public safety, General Manager Vining, of the Market Street road, San Francisco, said:

"The ground upon which a reduction of speed is requested is that of safety; yet I see no reason to believe that any speed can ever be adopted which will make it safe for parents to permit little children to play alone in the crowded streets; or for people, who from disease, infirmity or intoxication are unable to take proper care of themselves, to step suddenly in front of either a locomotive or an electric car in motion. As a matter of fact a number of the most serious accidents have been occasioned by children and others running suddenly in front of a car that was moving at a speed of not more than three or four miles per hour."

The preliminary list of manufacturers who have engaged space at the Electrical and Kindred Industries Exhibition to be held in New York in May, shows the interest which it has aroused among the electrical and allied trades, and is indicative of a fine display. The first exposition, held in 1896, will be remembered as a very successful one, yet at the corresponding time before the opening not one-fifth as many manufacturers had signified their intentions of making exhibits as have now secured space. The management is soon to announce the plans of the auxiliary and educational committee, whose work will be a particularly attractive feature.

An interesting feature in this issue is the report of the speed test on an interurban road, in which a speed of 55.5 miles per hour was made for a distance of one mile and a third; and an average of 45 miles per hour for a stretch of 17 miles. It points conclusively to the steady improvement in the possibilities of electric traction, and already compares very favorably with the ability of steam locomotives. It must be remembered these motors were not built for excessive speeds, but for the regular every day service. With the extension and increase of interurban roads we shall certainly witness a uniformly higher speed, and where such roads have their own right of way which can be inclosed, there is no reason why we shall not soon strike a pace and maintain it, too, which will be an additional source of grief to our steam road brothers.

All kinds of curious and unusual things occur in the operation of street railways, but Ottawa, Ill., comes to the front with the most remarkable exhibition of them all. The days of the street railway in that borough have not been so very few, but they have been very full of grief, and grief of all kinds, at that. The latest difficulty proved to be the universal desire on the part of the citizens to have the road again in operation, so that passengers on the steam cars passing through town might see the trolley, and realize the greatness of Ottawa—the only real difficulty being the belief that somebody else should do the riding and pay the fares. Recently the cash box of the company became so lean and ill favored that the wolf had entered and desperate measures had to be resorted to. As usual, in extreme emergencies, the women came to the rescue, and with nothing less than a volunteer concert for the benefit of the road. They sold tickets, hired a hall, took turns with vocal and instrumental numbers, and proudly rounded up \$300 clean profits. Now the manager has figured out that with about two such concerts a week, throughout the year, a Fourth of July dance and a turkey shoot at Thanksgiving, he could manage to keep the two car service in operation.

The salt question, which most street railway men thought had been permanently buried nearly 14 years ago, has risen from the grave and again stalks abroad. It is the alleged injury suffered by horses from contact with the brine that makes the ghost uneasy. This is particularly absurd, when it is remembered that some street railway men, who understood their business sufficiently well to make the road successful, in the old days kept their horses standing in brine for from three to six hours at a time, for medicinal purposes. It is odd also that the present fight against salt

should be in New York, when in 1885 the penal code of the state was amended so as to permit street railways to salt their tracks; this was brought about largely because of the facts developed by a discussion of the subject at the convention of the American Association in 1884.

As an introductory to an editorial which recently appeared, the "London Electrician" said: "There is a splendid field for British-made electric traction plant in America, as every electrical manufacturer in this country well knows; but the field nearer home, consisting in our own tramways, is by no means insignificant, and many of these sorely need electrical equipment in order to turn them into satisfactory paying concerns." No one can deny that there is a good American market for street railway apparatus, but it is hardly for the wares of British factories. It would be as inconsistent as carrying coals to New Castle. With a large per cent of the contracts for electric railways in the British Isles coming to America it requires considerable hardihood for a well informed technical paper to make the foregoing statement.

There is a disposition on the part of some British engineers and technical writers to decry any particular practice built on American experience. Credit for pioneer work is given grudgingly, and the sentiment prevails that the British engineers and manufacturing companies should be able to design and construct apparatus excelling that of American make without experience and experiments. Happily these sentiments are confirmed to those engineers who have stayed closely at home. All who have visited America have recognized the vast experience and development of electric traction in this country and are willing to learn and take advantage of the excellence of American equipments.

The statement is often made that the conditions are altogether different in England and America, but this hardly bears analysis as far as the apparatus is concerned. Certainly the engines and generators, designed to carry the heavy, fluctuating loads of electric railway lines, are suited for either country. In track and line construction it is improbable that the English engineers can improve upon American methods. The latter have been accused of being of shoddy construction, which in some cases is true, but hundreds of examples of the most substantial that need be designed can be found here. If the British are willing to pay for it the American factories can give them as good and enduring apparatus and equipment as they will likely evolve at home. The cars and car equipment can be designed for high or slow speed, light or heavy loads, level roadbed or steep grades, as the occasion may require, for there is hardly a condition likely to arise in England that has not been met with in America.

If the Englishmen could inspect the great factories which are now building street railway apparatus, with their special labor saving machines, their facilities for experimentation, and having the services of men familiar with every detail of railway work since its inception, they would understand why the best, cheapest and most efficient electric railway apparatus in the world is of American origin. As long as England could make the best boilers, engines, machines and manufactured products, they were purchased here; now let them follow a logical example and buy American street railway apparatus until the English factories can make something equally good and cheap.

## REPORT OF THE MASSACHUSETTS COMMITTEE.

The report of the special committee, consisting of Charles Francis Adams, William W. Crapo and Elihu B. Hayes, on the "Relations of Street Railways and Municipal Corporations in Massachusetts," of which the full text was published in the REVIEW for February, is a particularly able document, and the publication of the "Appendix" containing the data collected by the committee will be awaited with impatience.

There are a number of statements as to the "state of the art" at home and abroad, and as to the current beliefs regarding the same which can not be too often repeated, the hope being that they may be read and digested by the misinformed public which is now clamoring for the imposition of additional burdens on street railways, on the ground that the profits of the business are exorbitant; that the service rendered is more costly to the public; that there is not sufficient compensation for franchises and privileges; that there is fraudulent book-keeping to hide profits and avoid taxes; and in general, that things are much better managed where municipal ownership is in vogue. Some of these extracts from the report are here quoted:

"There exists, also, a vast and varied amount of popular misinformation as to results alleged to have been reached elsewhere, more especially in certain European cities. As regards these, indeed, statements are made of a character so wholly misleading that the committee finally reached the conclusion that it was safe to accept nothing unless verified by examination on the spot; for, even where the facts are in the main as alleged, varying conditions made the conclusions naturally to be inferred from those facts usually deceptive, and almost invariably in greater or less degree inapplicable here."

"As a working machinery for the daily accommodation of vast numbers of persons, the street railway companies of the Commonwealth fulfill their function quite as well, with as little friction and at as reasonable a cost as any other similar machinery elsewhere which the committee has had an opportunity to study. On this head, as already intimated, it is not safe to accept loose assertions, no matter how positively made or frequently reiterated, as evidence of what really exists. In every community, persons claiming to speak as authorities are apt to be in evidence declaring that somewhere else, in this case in Baltimore perhaps, or in Toronto, in Glasgow or Birmingham, or in Berlin, an ideal condition of affairs has been reached, in which perfect street railway accommodations, low fares, rapid transit, and contented officials and employes are working in harmony with a thoroughly well-satisfied municipal government, to the expenses of which the railway company contributes a liberal share, while at the same time paying reasonable dividends to its stockholders. The members of the committee have only to say that, if such a street railway Utopia anywhere exists, they have in the course of their investigations failed to find it."

"To institute a comparison, for instance, between the street railway transportation of Boston as at present developed and that of Birmingham, of Glasgow or of Berlin, is



so absurd as to suggest ignorance. The appliances in use in the European cities named may, and probably do, answer the demands there made upon them; but they pertain to conditions of urban life and of urban movement wholly different from those which now prevail in Massachusetts."

"The municipalities (in England) have, in fact, been so afraid they would in some way be out-bargained that they have as a rule fairly over-reached themselves; and now, after a lapse of twenty years, they are naturally served by undeveloped lines, with antiquated appliances, simply because they made it the distinct interest of the companies operating those lines to provide nothing better. \* \* \* \* Human ingenuity does not seem as yet to have devised any tenure under which men, much less corporations, will develop a business with the same degree of enterprise when they are working for the ultimate advantage of others as when they are working for themselves."

"As yet no attempt at the municipalization of street railways has been made in any country on a sufficiently large scale and for a long enough time to be of real significance. Glasgow and Leeds, for instance, are the two European instances more frequently referred to. From the statements often met with in the press, and the assertions heard in discussion, it might well be assumed that the experiments made in these cities amounted to an indisputable and established success; whereas, in point of fact, such is in no degree the case. So far from being a demonstrated success, it may, on the contrary, be confidently asserted that nowhere, as yet, has the experiment of municipalization of street railways been worked out to any logical and ultimate results whatever, nor can it be so worked out for at least a score of years to come."

"So far, however, as a further special street railway franchise tax is concerned, grave popular misapprehension seems to exist as to the burdens in the way of taxation to which street railway companies are already subject,—a misapprehension due in no inconsiderable degree to the indirect and anomalous character of those burdens. It seems to be generally assumed that the street railway companies received, and are now receiving, public franchises of unusual value, for which they pay no money consideration and render very inadequate public service; that their profits consequently are inordinately large is also assumed, and that those profits are in some way concealed through a system of vicious financiering and deceptive bookkeeping. The facts, however, do not seem to be as assumed in this presentation of the case."

"At the present time, the municipalization of the street railways is not accepted as by any means indisputably desirable in Great Britain, while in Germany it is regarded unfavorably."

The committee finds three lines of ultimate development into which the relations of street railway interests and municipalities seem in this and other countries to be working; these are that of (1) regulated private ownership; that of (2) the municipal ownership of a permanent way, to be operated by a private company as lessee; and (3) municipalization.

The chief objection to the first of these is stated to be that it necessarily involves a divided control of streets, resulting

in continual jealousies, misapprehensions and disputes. With the object of obviating this source of dispute the committee framed a bill under which the various obligations for paving, street cleaning, etc., would be commuted into a fixed money payment in the nature of a tax.

The committee is inclined, "in theory at least," to favor the second line of development, the third line, municipalization, being characterized as an experiment which will require a score of years to bring to logical and ultimate results. The public ownership and care of tracks and their private operation are urged as being in nowise different from the case of an omnibus line owned by a private company and the pavement owned by the city, except that the street car company would pay the city trackage for the use of a specially prepared way.

A bill has been drawn providing for the building or purchasing of tracks and overhead lines by the municipalities and their lease to the companies upon the payment of agreed rentals for the use and maintenance of the tracks. In case the two parties fail to agree the rental is to be fixed by referees appointed by the supreme court, the award to be based on the payment of interest on the actual cost of the tracks, together with a reasonable allowance for repair and renewal.

It appears to us that in recommending, even "in theory," the public ownership of street railway tracks sufficient weight has not been given to the fact that such an arrangement would take out of the control of the company the construction and supervision of a portion of its plant, the good condition of which is just as essential to the economical operation of the road as is an efficient and well-managed power plant, or repair shop, or efficient and careful employes.

As to how important a good condition of track is we may cite President Bowen, of the Chicago City Railway, in his paper before the American Association at St. Louis in 1896. By rebuilding the State street cable line (14 miles measured as single track) a saving in the cost of power for haulage of \$33,108 per year was effected; that is a saving of \$2,365 per mile per year.

For the estimated life of the new track the saving was sufficient to pay the principal and interest on nearly five times the cost of the improvement. And this did not take into consideration the decreased repairs of rolling stock and the increased comfort of passengers.

When the line is an electric one, in addition to the mechanical condition of the track, the efficiency of the rails as electrical conductors is equally important. And the overhead construction is another factor.

We consider that there would be two very serious difficulties to be met in any such system of independent ownership and operation; first, that of convincing the municipal authorities of the necessity of making proper repairs and improvements; second, that of getting the work honestly done when once undertaken. The care of the streets in all our cities is not such as to inspire confidence in the success of the municipality in caring for car tracks when the principal financial sufferer from neglect would be the operating company. And as for the manner in which the track building would be done, we might ponder upon the scandals and "jobs" which have in the past accompanied every governmental or municipal undertaking of magnitude.

## STORY OF THE GREAT STORM.

**Heaviest Snow in Many Years--Reports from All Parts of the Country--Record of the Splendid Work in Opening the Lines--Work of the Rotaries--Operation Resumed with Unprecedented Promptness--Six Days Fight at Quebec With Wind at 65 Miles an Hour and 12 Feet of Snow in the Streets--Valuable Experiences for Future Conflicts.**

The recent storms have in many quarters been the most severe in years, and the managers of street railways have found it necessary to exert every effort to get their lines opened up promptly when the worst was over. That these efforts were generally successful is a cause of pride. In some cities, as Boston, there were many telephone and other wires down across the street railway tracks which made it harder yet when the snow itself was a source of sufficient trouble. The city authorities some times added to the manager's troubles by insisting that he ought to clean off the street crossings, and failed to realize that he was doing all he could and that clean crossings were scarcely so important to the public as clean tracks.

Below will be found a few notes showing what street railways had to contend with and the means and methods used to keep the line clear.

The month of February proved a very costly one for the street railways of New England, but the greatest trouble was caused by the storms occurring during the first week of the month. Throughout that section of the country the reports tell of snow plows stalled and service suspended for periods of nearly a week on some of the smaller roads, notwithstanding the efforts made by the managers to keep the lines open. Ice on the rails and on the trolley wires were among the difficulties to be met in many places which were harder to overcome than the heavy fall of snow.

In the cities the greatest trouble was on account of fallen wires, not the trolley wires but telephone and telegraph wires which fell across the former, and until they were cleared away the railways could not turn the current on their lines for fear of injuring persons who might come in contact with the telephone wires. The delay thus caused placed the street railways at a great disadvantage. The Boston Elevated Railway Company suffered greatly for this reason. The cost of the storm to this company from loss of fares, repairs to wires, and for removal of the snow is estimated at \$200,000.

A few companies found their work of clearing the snow away hampered by the local authorities. The press reports contained the following account of the troubles of the Pawtucket Street Railway Company, of Providence, R. I.:

"The residents of Valley Falls and Lonsdale new village are for the present without trolley car service. There was a disagreement between the officials of the Pawtucket Street Railway Company and the town, as a result of which the railroad people abandoned the work of breaking out the track. Wednesday and Thursday the railroad company attempted to break out the tracks, but on Thursday afternoon Highway Commissioner Connolly put his men to work, who shovelled and scraped the snow into the tracks as fast as the railroad men shovelled it out. Then the Town Council, which was in session, called in Highway Commissioner Connolly and Superintendent Luther of the railroad. The question of whom was to remove the snow was discussed. The town officials held to the opinion that the railroad should remove it all at its own expense. Superintendent

Luther held that the town should bear half of the expense at least. No agreement could be arrived at and the railroad men withdrew, leaving the people to walk if they had rather do that than ride. The public opinion seems to be growing that the town should have borne the expense of cleaning up the street with the railroad company, as is done in Pawtucket and Central Falls. The people desire the conveniences of the cars, and are inclined to find fault now with the town authorities because they do not have the car service."

At Norwich, Conn., the worst trouble was in narrow streets where there was not room for the snow plows to throw the snow off the track without covering up the sidewalks.

The storms were severe in Vermont, from 12 to 20 in. of snow falling. E. C. Crosby, general manager of the Springfield Electric Railway Company, writes that he kept his 7½-mile electric freight line open by using his snow plow with the freight locomotive coupled behind it to help push. The plow is a Smith & Wallace nose plow equipped with two Westinghouse 50-h. p. motors. Only slight delays have been experienced because of snow.

One of our illustrations shows a view on the line of the Fitchburg (Mass.) & Leominster Street Railway Company after the track was cleared. The superintendent, W. W. Sargent, writes that he experienced the usual difficulties and that no apparatus with which he is familiar could have effectively cleared the tracks during the height of the storm. By putting shovelers at work at the worst places and running all the plows and sweepers, the road was kept in such condition that cars were operating over two-thirds of it when the storm ceased and by noon of the following day cars were on schedule time everywhere.

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**Bangor, Me.**

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W. H. Snow, superintendent of the Bangor (Me.) Street Railway, writes as follows: "The street railways of Maine have had their share of snow this winter, and although the weather has been warm for the past few days, the snow of course settling a great deal, it still averages, March 2, 20 in. in depth. The first storms of the season were of a character easy to be handled, from 3 in. to 9 in. of light snow falling at different times.

"These storms were taken care of entirely by two home made plows, each equipped with two G. E. 800 motors.

"The wings of the plows hang from the trucks, and are in two pieces with a joint in the middle so that the outside wing can be lifted without moving the whole wing; they are guided by chains running to the front of the plow, and are easily adjusted. When the wings are out as straight as is at all practicable a space 24 ft. in width is cleared and, as the quantity of snow increases, the wings are narrowed up little by little. In light storms the plows are used single, in heavy storms two cars are usually coupled on behind each plow. When storms clear off in the day time as soon as the streets are passable for teams we withdraw the plows



until night and then run them out and push back all loose snow; the wings take up so much of the street that we can operate with much more ease and safety when they are free from teams. Where the streets are wide six-horse road machines are used to scrape the snow from where the plow wings leave it to the side of the street. On narrow streets we cart off all the snow left by plow wings.

"We have had little or no trouble with sleet on the trolley

to February 24 at 11:30 p. m., that being the longest stretch of the winter.

"During storms we plan to keep our conductors and motormen well fed, never intending to let them go over six hours without eating. No matter how tired and sleepy a man may be, take him in and fill him with hot coffee and hearty food, and you have a new man. We have found that it is cheaper in the end to stop operations for 15 or 20 minutes in a storm and freshen up the men with food than to try to push on with a lot of cold and hungry workers. We make up the loss a dozen times over we think by so doing. Of course if the rail were covered with slush and about to freeze up that would be another thing, but in nine out of ten storms the few minutes can be taken, and to a good advantage to both men and company."

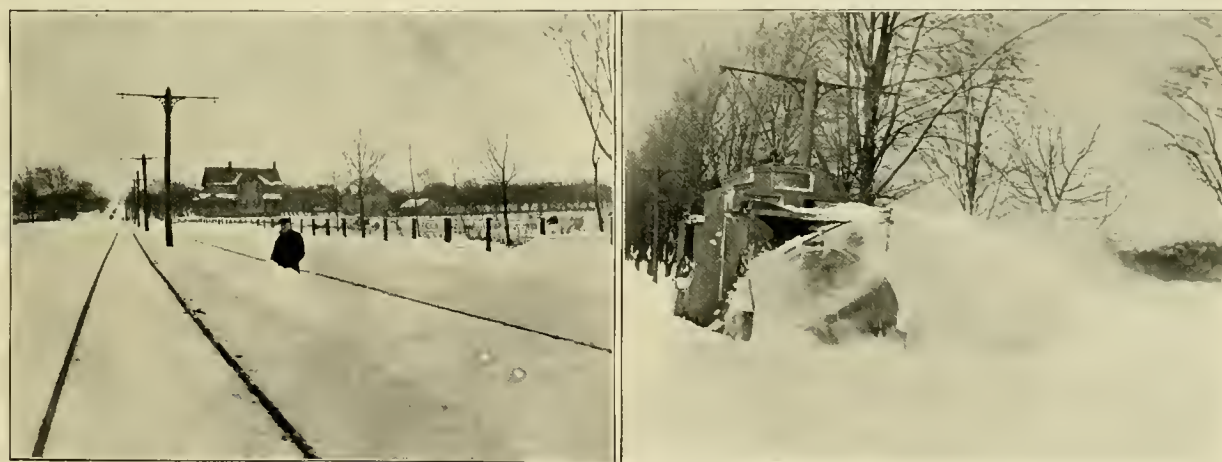
### Rochester, N. Y.

At Rochester, N. Y., the storms of January 31 and February 16, were the cause of extraordinary trouble to the street railway company. In the first of these there was a fall of from 8 to 10 in. of dry snow, and a heavy wind which drifted the snow until in many places it was 6 to 7 ft. deep. The second storm was wet snow and it also was badly drifted and very difficult to handle. In each of these storms the superintendent, J. W. Hicks, began working the company's plows when the snow commenced falling, and continued until the storm was entirely abated. The cars were kept running on as nearly as possible schedule time, and thanks to the untiring energy of Mr. Hicks in keeping his plows at work there was scarcely a moment's delay on any of the 22



AT FITCHBURG, MASS.

wire, although the rails have iced badly three or four times; in one storm in particular the ice was so hard that



TRACK AND SNOW PLOW AT WORK, ROCHESTER, N. Y.

the plow diggers would not break it—the plow would simply run up on to it and ground. We coupled five cars together, the forward car using no power—simply being pushed by the other four—its weight crushed the ice enough to allow the scrapers of the other cars to clear the rail. By the time the third, fourth and fifth car got along the rail was in pretty good shape. The hardest storm of the winter was the last one—that of February 23, 3 in. of light snow and 6 in. of hail on top of it falling in 10 hours. We used plows, cars, six-horse road machines and a great many teams and men, and managed to hold about one-half regular schedule time. It was necessary for us to run either plows or cars continuously from February 22 at 5:30 a. m.

lines of the Rochester Railway Company. The first of these storms was the one which caused so much trouble in the eastern cities and T. J. Nicholl, general manager of the company, feels very well satisfied with the record made on his road.

This company has eight electric plows, two Ruggles electric rotary plows and one Ruggles track cleaner, manufactured by the Peckham Truck Company, one electric sweeper and plow combined, and six horse plows and levelers. All of these were in use during the heavy storm. On the suburban and outside lines, where the drifts were worse than in the city, it was necessary to use the Ruggles rotary plow, and speaking of this Mr. Nicholl says that he believes it to

be the best track cleaner in the market. On the city lines the sweeper and plow does the best work, as it leaves the rails perfectly clean, and throws the snow far enough back from the rails. Track scrapers are used on all cars and are found very efficient. With an icy rail the horse plows are much better than the electric plows.

The illustrations show a view on one of the lines after the tracks were cleared and also the snow plows in action.

#### Bay City, Mich.

The storm of February 19-21 was very severe in Wisconsin and Michigan. At Bay City the Consolidated was compelled to abandon nearly all its lines on the night of the 20th. It put its men at work clearing the tracks at 4 o'clock the following morning, but they were obliged to desist after a short time, because the work proved to be perfectly useless, the gale driving the snow back into drifts again. They commenced again at 9 o'clock and opened up the city line. In the afternoon the track was opened to South Bay City, by first running two snow plows each drawn by four horses, and following it by four cars with track scrapers. On the Essexville line the same tactics were pursued, a large force of men with shovels to remove deep drifts also being used.

#### Milwaukee, Wis.

At Milwaukee the company made heroic efforts to keep its lines open, but was compelled to abandon many of them. The plows were put at work the morning of the 19th and kept running until the lines were cleared, although it was found impossible to keep them all passable for cars. On the South Milwaukee line traffic was suspended from Saturday until 11 o'clock Tuesday, and some of the other suburban lines were in the same shape.



ON THE MILWAUKEE, RACINE & KENOSHA.

This was the first winter in the operation of the Milwaukee, Racine & Kenosha line, and it came in for its full share of grief. The storm was particularly severe in the district covered by its lines, and yet the road was opened and travel resumed with a promptness which reflects credit on the management. The line is 30 miles in length, almost en-

tirely out in the country where the storm had full sweep, and about 25 miles of the line had drifts ranging from 18 in. to over 6 ft. in depth, and packed so hard and firm that in many places it had to be broken with picks and taken out in blocks with a shovel. Such spots, however, were the exception, and the work of the plow was very effective and highly satisfactory. An eye witness relates frequent runs of 300 to 500 ft. through snow 2 ft. to 3 ft. deep. The cars worked finely. One run into a frozen bank was made with sufficient force to break the cast iron nose of the plow weighing 1,250 lbs.

Our illustrations tell the story of the conflict most graphically, showing the various stages of before and after "bucking." In one view it will be noticed the snow was thrown nearly to the trolley wire; in another the compactness is seen in the huge blocks thrown out; in another the clean track when the plow had conquered.

The plow which is shown in action in the illustrations is the standard nose plow made by the Taunton Locomotive Manufacturing Company, and is much smaller and lighter than the heavy plows which are recommended for such service. The superintendent of the road, J. R. Nelson, speaks very highly of the apparatus and the builders are quite proud of its performance.

#### Grand Rapids, Mich.

G. S. Johnson, president and general manager of the Consolidated Street Railway Company, Grand Rapids, Mich., writes us regarding snow, and the means of overcoming it, as follows:

"During the past winter we have had extraordinary snow storms and unusual difficulty in keeping our tracks open. A good many storms have prevailed, but the one which visited us on February 19, and continued for three or four days, was, by far, the worst in the experience of this company, and taxed our resources to the utmost. The fall of snow was probably 2½ ft. on the level and, in many places, the accumulation caused by drifts, was over 5 ft. deep. In spite of the tremendous task which presented itself, we were determined that our lines should not be blockaded and that our service should not be stopped. To accomplish this every device in our possession and all the forces at our disposal were kept busy night and day. Our sweepers and snow plows left their shelters early in the evening and did not return to them for two nights and a day. When relieved, they were as much exhausted as the men.

"We had two very large snow sweepers, a large switching motor and several horse snow plows in operation and probably a hundred men (extras) during this period. With this help and the determination to keep our lines open, we succeeded in preventing the interruption of traffic, while in a good many cities travel was entirely abandoned.

"Our usual method of procedure was to start out our snow plow, or switching motor, equipped with wings; follow this up with a sweeper, after which would come the salt cars; and, often, to widen the path and keep the snow from falling back on to the track, the old horse snow plows, which had not been in use since the horse cars were placed on the retired list eight or nine years ago. All these were followed up by men with shovels, whose duty it was to throw the snow out of the way where it was too deep for horses to travel through. The result was that the tracks were left and kept in a tolerably free condition, but the



streets, on the sides of the tracks, were bad, so that it was almost impossible to traverse them with sleighs or any other vehicle. But our people were so glad for the service that little complaint was made of this condition of affairs. I am sorry no photographs were taken of the snow heaps before and after we had completed our work on them. It would be difficult to believe, after remembrance has past, that the streets in any city were piled so full of snow as some of ours were during this last storm.

"As I have said, we have two sweepers, a switching motor, used for switching purposes but convertible into a

many places, because we have no lines which are not badly cut up with grades, some being even as steep as 10 per cent."

Several managers have written us describing their methods and apparatus in detail. On one road with 20 miles of track there are no plows or sweepers, but the cars are equipped with track cleaners which it is stated readily keep the rail free from snow. In case the snow gets too deep between the rails, an A-shaped drag made of 2 in. x 12 in. x 10-ft. oak planks is fastened to the rear draw head. If a real blizzard comes and there are bad drifts which the scrapers and drag can not clear out, the cars are run into the barn



TAUNTON SNOW PLOW ON THE MILWAUKEE, RACINE & KENOSHA.

snow plow, and eight or ten horse snow plows. All of these were built in our own shops.

"The switching motor is a 60-h. p. apparatus, and the motors are two Rae, or Detroit, motors of 30 h. p. each. The motors which operate the sweeper are two Edison No. 12, which are 25 h. p. each. The sweepers are similar to those built elsewhere; the brushes being composed of rattan, placed in rollers and cut about 33 in. long. The brushes are so arranged at an angle with the track as to take the snow from the center of the way and throw it outside, clear from the rails. They are very effective.

"We use a good deal of salt to keep our rails in suitable condition. Salt is a most disagreeable adjunct and leaves the streets in very bad condition, but it is an aid to electric railway operation which cannot be supplemented or duplicated. We regret its use, but have been unable to find a substitute. We would have great difficulty, at times, to operate without a liberal use of it.

"No doubt the conditions are worse here than in a good

until the storm is over. Then the track is cleared by a road scraper drawn by horses.

The manager of a 40-mile road writes: "We have six snow plows equipped with independent motors of their own, that are used in heavy snows. For light snows the scrapers that are attached to each car answer the purpose and keep the track clean. When the snow becomes deep the heavy plows are put out, and they not only clean the snow from the track but have an arm reaching out to widen the roadway so that we can keep the rails in proper condition. We do not use sweepers of any kind. In exceedingly heavy snows we find it necessary at times to use the 'walkaway' horse plow outside of our rails to level the snow in the gutters. We have certain conductors and motormen that are familiar with all our lines, and men that have been with us for a number of years, who operate the plows. Each winter these men are assigned to certain plows and are notified by the superintendent or foreman when it is necessary for them to report for duty, so that if it is necessary to put the



LORAIN &amp; CLEVELAND SNOW PLOW.

plows out we have the men on hand to run them. We have a sweeper in addition to our plows, but we have never had any success in using a sweeper to fight snow with in this section of the country. We are a firm believer in plows for keeping our tracks open."

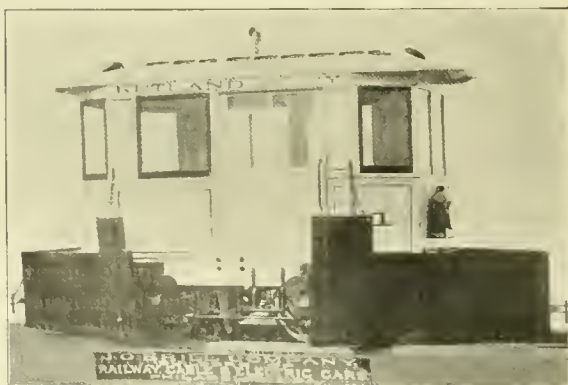
Another manager writes: "We have about 20 miles of track. We have two electric sweepers and two plows (one two-horse and one four-horse.) The plows are not used excepting in heavy storms, as the electric sweepers successfully handle any snow not over 6 in. deep; if the snow is light and dry the sweepers will take care of it up to 12 in. deep. It is a real pleasure to fight snow with the large



BRILL SHEAR PLOW.

sweeper (which was built in our own shop); it has the comfort of electric heaters and the convenience of electric brakes, and all levers are worked from a sitting position. When run the plows are operated by the trackmen, who are employed with the understanding that they will do extra work in snow storms. The train dispatcher gives special attention to the service during storms, and a point is made of getting to work at the commencement of the storm, so that it will not get the best of us."

Among the illustrations are three snow plows built by



NOSE PLOW.

the Brill Company. That built for the Meriden Electric Railroad is a shear board, and that for the Rutland Street Railway a nose plow. In both of these the length over the end sills is 16 ft., and the width over the side sills 6 ft. The cabs are sheathed up on the sides and entirely around the ends. They are provided with sand boxes. On both of these plows the height of the shear board is 36 in. The third one is a construction car built for the Lorain & Cleveland Railway Company, and fitted with a removable snow plow attachment. This car is 24 ft. long and 6 ft. 1 in. wide; the sills are 3 $\frac{3}{4}$  in. x 7 in., and the floor of 1 $\frac{3}{4}$ -in. stuff. The front end is vestibuled, and has a door on one side with a drop sash on the other. The roof is a plain arch with a trolley board at the rear end. The open part of the plow has drop sides 24-in. high with strap hinges the full width; sides are in three sections and the end in one; the sides are fitted with curtains all around. There are two large boxes on each side for sand or salt arranged to deliver between the trucks; the valves are enclosed in water tight boxes. The nose plow is in two parts and is fitted up with the usual hand wheels for raising and lowering the movable part; at the sides there are long shears to level off snow thrown aside by the plow. The car is mounted on two No. 27 trucks, the standard of the railway. There are four G. E. 57 motors. The wheels are 33 in. in diameter with 2 $\frac{1}{2}$ -in. treads. By removing the plow and wings the car is capable of being used for all sorts of construction purposes. It is fitted with extra heavy springs so as to be able to carry loads of rails when necessary. The framing is made heavy enough to enable it to do the most severe work in heavy snow.

#### Muskegon, Mich.

Fred. W. Thompson, superintendent of the Muskegon (Mich.) Street Railway Company, had to engage in a long drawn out combat with snow and describes his experience as follows:

"The performance was almost continuous from January 22 to February 5, and from February 19 to 24. We have a sweeper, a walkaway plow and a salt car, and all these were used pretty much all the time; in addition we put on a large force of men with snow shovels. Our track is 12 miles in length, including branches. The sweeper has one 15-h. p. motor for each broom and is pushed by one or two motor cars (as may be necessary), each having two 20-h. p. motors. My plan is to start out either on foot or with a team, when the storm begins and find where the heavy drifts are and send men to such points, so that the sweeper may not be stopped when it reaches there, but there were so many big drifts this winter that the sweeper would catch up occasionally, then all hands would turn in and shovel. From 8 p. m. January 22 to 8 a. m. February 5, the sweeper was on the road 160 hours, and as we can sweep the road in 2 $\frac{1}{2}$  to 3 hours ordinarily, it will be readily seen that there was 'heaps of trouble on the old man's mind'—in fact we had to work night and day during this two weeks. In 25 years' experience on steam and electric roads, I have never known anything like the continuity of blizzards that we have just experienced. The snow on our lines was from 2 ft. to 12 ft. deep. I understand that the government reports say that our district was the center of the heaviest snow that fell during this period. We certainly handled more snow than ever before. A large item of expense here was, owing to the





SCENES IN MUSKEGON, MICH.

enormous quantity of snow, which when swept and thrown out left a deep and narrow trench, to be quickly drifted full by the next storm, and which had to be constantly widened, so the sweeper would have room to throw. All our regular men were on call at all hours, and worked like horses, and our road gave very good service throughout.

"Tell me ye winged winds,  
That round my pathway roar,  
Do ye not know some spot  
Where blizards howl no more,  
Where snow falls not in solid chunks,  
From north, south, east and west,  
And where the weary manager  
Can snatch a little rest.  
The loud wind dwindled to a whisper low  
To gain more strength and answered—"No."

The illustrations reproduced from photograph kindly sent us by Mr. Thompson show three views on the line on January 25. No. 1 shows the plow in a 12-ft. drift; there were several long drifts from 4 ft. to 10 ft. deep; No. 2 was taken at the point where the depth of snow was least, on the top of the bluff. No. 3 is a view of the sweeper on its way home.

**London, Ont.**

The London (Canada) Street Railway Company on February 20 and 21 had to deal with the most severe storm in its experience, and for the first time in the three years of electrical operation the car service was tied up because of a

storm. The general manager, C. E. A. Carr, writing of this storm says: "It started with rain and sleet which froze upon the rails and wires and as we do not operate cars on Sunday, the groove in the girder rail completely filled with ice. The temperature gradually lowered and the rain turned to snow and fell so thick and fast that it was almost impossible to see across the street. This made a mixture of slush too heavy for the sweeper to clear. We suffered more from ice in the groove than from any other cause, as cars would leave the track every few yards and our service was demoralized for the greater part of Monday.

"Our appliances for fighting snow storms consist of heavy rattan sweepers of 100-h. p. capacity, with scraper cars and plows, which follow along behind the sweeper leveling the snow back from the track allowance. In addition to these we have a 'Monarch' snow scraper attached to a couple of cars on each route, which keeps the snow back from the track until the sweeper gets around again. With this equipment we have no trouble, and had it not been for the fact that the storm struck us on Sunday, when we do not run cars and our plant is shut down, we would have kept ahead of the storm, but before we could get steam up, the grooves were filled with ice and it was impossible to make much headway. This is one of the drawbacks of not operating cars on Sunday.

"The question of bucking snow is one which every railway manager in Canada must understand, and from early December until sometimes late in April our storm gangs are



STREET SCENES AT LONDON, ONT.

at work, occasionally night and day continuously. For this purpose we have a separate organization, which consists of a snow foreman whose duty it is to keep posted on the probabilities and watch carefully the condition of the tracks, and he is held responsible if he allows a storm to get the better of him. There is very little excuse for a Canadian road being tied up with an ordinary snow storm or blizzard and the storm gang should always hold itself in readiness to get out at a moment's notice. With the proper equipment, if taken in time, an ordinary storm should not interfere to any extent with the schedule time of the cars."

The illustrations show street scenes in London and serve to give an idea of what Canadian roads have to do in the way of fighting the storm king.

At Hamilton, Ont., also there was a great deal of trouble. The trolley wires were covered with sleet and the rails with frozen slush, making it difficult to operate the snow plows. By working Sunday night the city lines were opened for traffic and the car made the runs to the early morning trains on Monday. The Hamilton, Grimsby & Beamsville road was not opened for traffic until Monday afternoon; this line carries a great deal of milk to Hamilton and the blockade was hard on milk users. The Hamilton & Dundas line was blocked only a short time. The Hamilton Radial Electric Railway Company experienced difficulty with the frozen slush on the city end of its line; the road outside the city was easily cleared by means of a rotary plow and during Monday forenoon cars ran only to the city limits.

#### Chicago.

The Chicago Electric Traction Company, better known as the storage battery road, in the snow fighting it has had to do employed a plow and a sweeper. The plow was made by the J. G. Brill Company. The dimensions are: length



STORAGE BATTERY ROAD, JANUARY 25.

of body, 20 ft.; length from point to point of plows, 31 ft.; height, 12 ft. The weight including batteries is 22 tons. The motor equipment consists of two 50-h. p. Walker motors, one to each axle. There are two sets of batteries, which work in parallel; the batteries are 400 ampere-hour cells. The greatest distance which has been made with this machine without changing batteries is 24 miles. When the snow does not exceed a depth of 2 ft. the plow handles it



M'GUIRE SWEEPER ON THE STORAGE BATTERY ROAD.

easily without stopping and when bucking drifts it has been able to run a distance of several hundred feet through snow 5 ft. or 6 ft. deep. The general manager of the road, E. R. Gilbert, writes us that this plow is a "little wonder" and that he has never seen a trolley plow which would do the work of this one.

The sweeper is 35 ft. long outside and is the largest one ever built by the McGuire Manufacturing Company. The weight with batteries is 28 tons. There are three 50-h. p. motors, one to each axle and one to operate the brooms. There are three batteries, one for the broom motor and two working in parallel for the traction motors. The longest distance made without changing batteries is 18 miles. Regarding the sweeper Mr. Gilbert says that he is just as proud of the work it has done as is the McGuire Company.

The method of using these machines depends upon the quantity and quality of the snow. When the snow is dry, the plow is first sent over the line and followed by the sweeper. If there is a heavy damp snow they are used independently, being sent in opposite directions, and one does the work as well as the other. With these two machines Mr. Gilbert has kept his 26 miles of track open, except for four or five hours during the heaviest storm, and he states that in all the cases of which he has knowledge this line was open sooner than trolley roads operating under similarly exposed conditions.

H. M. Sloan, general manager of the Calumet Electric Railway Company, last year designed a 29-ft., 200-h. p. snow plow in which were embodied some ideas of his own as to how the shear should be arranged to give the best results. This plow was illustrated in the REVIEW for March, 1897. There are nose plows at each end and a spring supported shear under the middle of the body between the two trucks. During the recent storms it was demonstrated that this plow was fully capable of handling the heaviest drifts, and quickly cleared the road.

#### Sheboygan, Wis.

At Sheboygan, Wis., the snow was light and dry, but there was a heavy fall, estimated at 2 ft.; it was badly drifted, in many places to a depth of 6 ft., and some of it was well mixed with sand. Edwin L. DeBell, secretary of the Sheboygan Light, Power & Railway Company, sends us the following description of the apparatus and methods used in fighting snow.

"Our principal and most effective weapon is a home made snow plow, designed and constructed by J. M. Saemann, vice-president of the company. We used the trucks of an



old sprinkler car, and put a V shaped plow on each end. The plows are made of 3x12-in. white oak, faced with  $\frac{1}{4}$ -in. boiler iron. The side arms are made of 3x8-in. maple, faced with old tram rail. Heavy clamps are fastened to both sides of the car frame, to hold up the side arms of the plows, and are made so as to permit the raising and lowering of the plows at will. The plows have adjustable top pieces, made of  $\frac{1}{4}$ -in. steel, to increase their height when bucking deep snow. For double track work we have an adjustable wing, 7 ft. long, 2 $\frac{1}{2}$  in. thick and 14 in. high, faced with  $\frac{1}{4}$ -in. iron, which can be readily hinged to the nose of the plow. The front end of the wing is held in place by an iron bar running back and fastened to the plow proper. The wing is raised and lowered by means of a chain, running from its front end into car.

"Back of the plows are track scrapers, working directly on the rails. They are hinged to the plows, but work independently and leave a clean track for the motor car pushing the plow. One man operates the device, raising and lowering the plows with a hand lever, and the scrapers with a foot lever. For single track we use wings 2 $\frac{1}{2}$  ft. long, attached to the rear ends of the plow shears, to throw snow away from rails. In center of the car is a 500-lb. salt tank, with spouts directly over the rails, which requires a man to operate it.

"We have cleaned 2 $\frac{1}{2}$  ft. of snow from our tracks with this device in a very satisfactory manner, so that cars could follow the plow at once. This plow was made largely of old materials on hand, and it has proved an inexpensive and efficient one.

"For leveling the snow at the sides of the tracks we use two-wheeled graders.

"We find from experience the cheapest way to handle

snow is to start the plow as soon as it begins snowing, and keep it going until the fall has ceased and the tracks are entirely cleared."

It is not everywhere that the manager has had to stay up nights and direct the snow brigade. At Butte, Montana, there has been less than a foot of snow during the winter and never more than 2 in. on the ground at one time. The manager of the Consolidated road states that he has only sympathy for his brethren in the God-forsaken storm and blizzard-swept east, who are out bucking snow while he enjoys the health-giving and spice-laden breezes and delightful "Chinooks" from the Japan current. For the last 60 days the temperature at Butte has averaged but little below the freezing point, and bicycles are much more in demand than snow plows.

At Omaha, while there has been considerable snow, General Manager Smith, of the Omaha Street Railway Company, reports that it was only necessary to run all night on two occasions; one night the electric sweeper was kept at work, and once it was necessary to use sleet cutting trolley wheels and keep cars out all night. The trains were running on time in the morning and practically no delays experienced.

A manager who has had a great deal of experience in fighting snow has written us expressing the opinion that there is room for improvement in snow plows and suggests the following points: More powerful motors, smaller wheels, and the abandonment of sprockets and chains for connecting the motors to the axles, the idea being to secure greater power, strength and simplicity, and consequently a more reliable machine. The most important thing is to have motors of sufficient power, so that the plow can be forced through. Another manager has recently had built



SCENES AT LOCKPORT, N. Y.

in his company's shops a double track plow with 30-in. wheels and motors carried on the axles.

The Sandusky, Milan & Norwalk Electric Railway reports considerable trouble with snow, but less difficulty in keeping its track clean than city lines would have because it is laid along the side of the road and is not traveled by teams. The freight car owned by the company is equipped with track scrapers which will clear away 6 or 8 in. snow, and is used instead a regular plow. Where the snow is deeper it is necessary to clear it away by hand.

On February 15 street car patrons in Cleveland had a very disagreeable experience, there being a blockade on the street car lines and a blizzard. About 5 p. m. a large generator in the power house of the Cleveland Electric Railway Company was burned out, the snow storm throwing an overload on the plant. The Cleveland City Railway Company operates the down-town lines jointly with the Cleveland Electric, and could have cared for those lines without difficulty had it not been for the fact the lines are so connected that to feed one meant to feed all. The result was a blockade for about an hour and a quarter.

The Pennsylvania roads have in general experienced but little trouble with snow this season. S. S. Crane, superintendent of the Altoona & Logan Valley Electric Railway Company, reports that their snow equipment comprises one sweeper and one plow. The plow is a home-made one, weighing about 5½ tons, and has been found heavy enough to cope with all drifts that have been encountered. The cars on both roads of this company have made schedule time each day this winter, and there was but one delay last winter, when the cars lost 52 minutes while the sweeper was disabled.

#### The Storm at Providence, R. I.

BY J. H. DE GURCHY.

On Monday and Tuesday, January 31 and February 1, we experienced in New England, what was, almost everywhere, one of the most severe and destructive snow and sleet storms in the history of the street railway, telephone, telegraph and fire alarm systems. It snowed steadily Monday, but the snow being light and dry, caused no great inconvenience until 11 p. m., when it turned to sleet, and the temperature having risen to 32° F. produced ideal conditions for loading tons of ice upon all exposed wires and cables.

Notwithstanding the fact that many telephone and telegraph wires succumbed to the combined strain of ice and wind, the wires of the traction system remained intact without an exception, although hundreds of wires and many poles of the telephone system were broken, falling into the streets, grounding trolley wires, and sawing into many of the high tension wires of the electric lighting company.

The Narragansett Electric Lighting Company humanely shut down the high pressure service, but owing to the splendid line construction, and exceptionally good system of strong and well placed poles, they were not so severely inconvenienced as might be expected in consequence of such a severe battle of the elements. This company is to be especially commended for its great concern for public safety, and for the remarkably short time in which it cleared the wires and resumed the service, both municipal and private. The only fatalities reported were those of two horses, one of which could have been prevented if the spec-

tators had used a little common sense. The animal was slowly electrocuted, showing that the pressure must have been very low. Unfortunately the majority of a street crowd look upon an electric wire as something necessarily fatal to all who approach. This is due to the prevailing ignorance of the conditions necessary to shock. In this case a fence rail could have been used to lift a telephone wire off of the animal's body, which would undoubtedly have saved him. The depth of snow between the horse and rails must have greatly reduced the possible pressure which the animal would have received had he been in actual contact with the rails.

During the height of the storm, our system was in good working order, the cars and plows all running on storm time.

Now why could we not run our cars through 17 in. of snow? We have previously run through more snow which fell in a much shorter space of time. It was because the telephone and telegraph systems of wire and pole construction, were not equal to the enormous stress of ice combined with the high wind pressure. Consequently, the street railway system was handicapped at a critical time by falling wires, which grounding the trolley wires made it impossible to run either cars or plows. The short circuits produced on most of the sections were so heavy as to prohibit the resetting of the circuit breakers. The accompanying photograph shows what was the rule rather than the exception. The combined leakage load was of such proportions as to be sufficient to operate at least 250 cars. The snow and rain continued to fall, freezing into a solid mass, which after a few hours of trampling down by wheeled vehicles, horses, sleighs and pedestrians would have successfully resisted a steam locomotive.

It was necessary in order to open the lines to put large numbers of men at work loosening and casting away the beaten path of snow, before the plow could be forced through with the aid of one and sometimes two trolley cars. The loss to the road was two or three days' receipts, and the cost of employing a thousand men and the necessary horses, carts, etc. Between \$30,000 and \$35,000 was lost, and the only benefit two or three days' work for a few hundred otherwise idle men.

I have given the load curves for the six days commencing with Monday, January 31, which will show the actual load for the week, from 7 a. m. to 7 p. m., Monday being the heaviest, Tuesday the lightest, and gradually returning to normal conditions, which are reached the latter part of the week.

Now the remedy is to put the low pressure wires underground, at any rate within the city limits. The disadvantages of carrying such wires on poles have been frequently demonstrated in this city. The advantages of placing underground the multitude of wires now carried on poles in nearly all large cities are, with good conduits and cables, the following:

1. Almost absolute protection from the elements.
2. Freedom from damaged or burned out telephones, due either to crossed wires or inductional discharges of lightning.
3. A general reduction in the cost of repair and maintenance. The first cost of conduits for low pressure service is not prohibitive.

Placing high pressure arc or incandescent lighting wires,



with an e. m. f. of from 2,000 to 6,000 volts, or even electric traction wires of from 500 to 800 volts, would be inadvisable in many instances, from a physical as well as a financial standpoint.

A conduit could not be procured at a reasonable cost to successfully withstand the stress of such pressures, in heat or cold, snow or rain; except in most level, high and well drained areas, free from the effects of exceptionally high tides. Even then there is the ever present danger from the

There is no certainty that the present system of electric traction will be the one of a few years hence, and when any street railway company has put forth its best efforts, without sparing expense, to give the municipality a first class and sightly overhead equipment, it would seem unfair to compel it to assume the burden of the enormous expense of changing the whole line equipment under unfavorable conditions, and with no assurance that it would not be obliged to discard that in turn, at some future day, for the possible benefits of improved alternating systems, or of traction units self-contained.

Although the indications of current progress do not especially point to such a sudden and complete change from present methods, still there is the possibility. It would appear that if the electric motor is to supersede the steam locomotive, it must be as independent in respect to distances, and just as self contained. The greater the necessity the greater the incentive; and the greater the incentive the more certain the results.

### The Quebec District Railway and the Snow Storm.

BY EDWARD A. EVANS, MANAGER AND CHIEF ENGINEER.

A glance at a map will show that Quebec is situated on the River St. Lawrence in latitude 46° 48' and because of its situation is terribly exposed to the full sweep of the easterly gales so frequent in this part of the country; it will also be observed, that it is about on the same parallel as Bismarck in North Dakota; it has a population of about 77,000, and with its narrow streets, and old-fashioned houses, is particularly susceptible to snow blockades, the roofs of the houses, one would think, having been purposely constructed with the object of assisting to blockade the streets, by dumping all the snow they receive into, or near the centre of the roads.

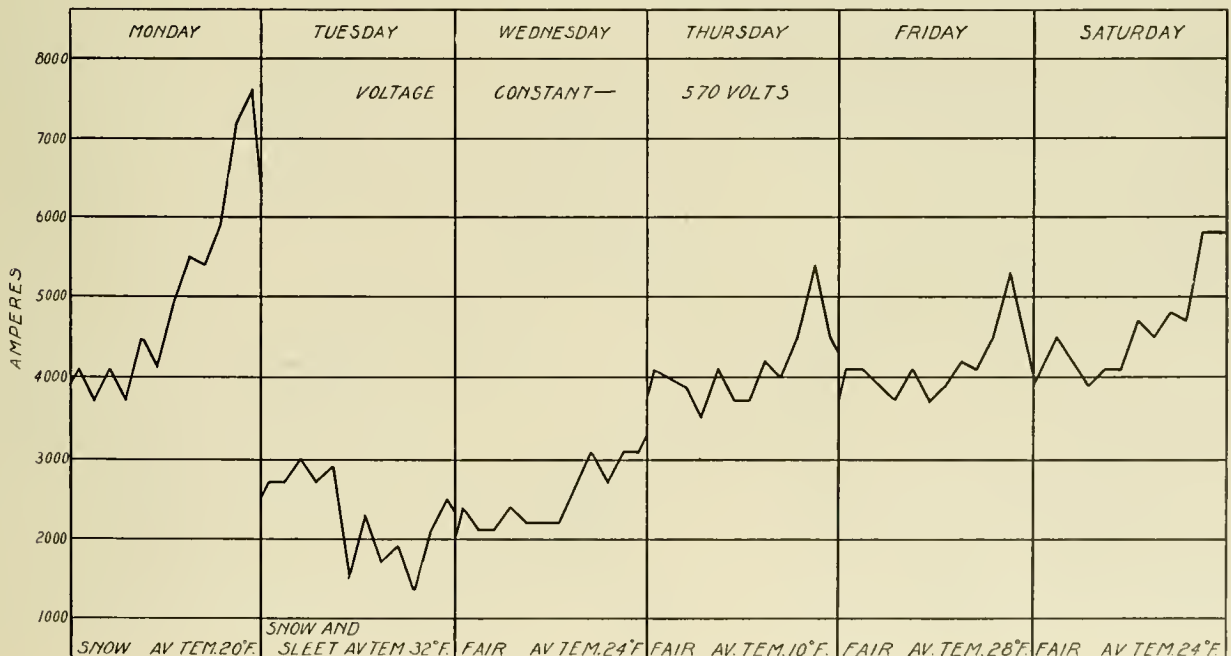


SCENE IN PROVIDENCE.

explosion of gases which are bound to collect in enclosed spaces underground, and which are a menace of no mean proportion in themselves.

In the case of the overhead wires of traction companies there is another reason why they should not be changed.

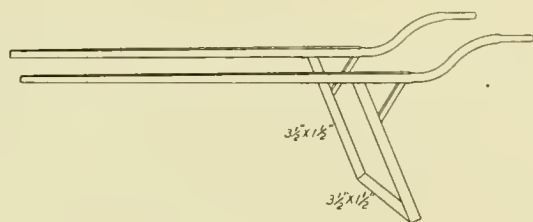
LOAD LINES FROM 7 AM TO 7 P.M.



UNION RAILROAD, PROVIDENCE, R. I., JANUARY 31-FEBRUARY 5.

The Quebec District Railway operate at present 13.37 miles of track, and covers 10 miles of streets, and may be said to be divided into sections as follows: In the Lower Town, between the Champlain Market, steamboat landings and railway stations, to the western boundary of the city at St. Sauveur. In the Upper Town; between the General Post Office, Chateau Frontenac, and other principal hotels, via St. John street to Maple avenue, just outside the western limits of the city, and near the celebrated Plains of Abraham (where Wolfe fought his great and final battle) and returning via Grande Allee to the General Post Office. The Crown Street line, running across the city and connecting the Upper and Lower Towns at about midway of their length. The Palais Hill line, running across the city and connecting the Upper and Lower Towns at a point to intercept the railway and steamboat travel, and to connect the same with the principal hotels, more especially the Chateau Frontenac.

Of these routes the Lower Town may be said to be level; the Upper Town has a mean grade of about 3 per cent, with a maximum of 8.5 per cent; the Crown Street a mean grade of about 6 per cent with a maximum of 14.5 per cent; and the Palais Hill a mean of about 8 per cent, with a maximum



QUEBEC ICE CUTTER.

of 11 per cent; the curvature for the most part is sharp, the curves ranging from 200 ft. to 35 ft. radius; which latter are rather numerous, owing to the narrow streets and the difficulty in rounding corners.

The equipment consists of thirty 18-ft. vestibuled cars, each with two 12A Westinghouse motors, etc., three trailers (old horse cars supplied with new trucks), five sweepers, each equipped with three 12A Westinghouse motors (two for operating the car and one for the brushes), nine "Walk-away" plows made by the Fleming Manufacturing Company, Fort Wayne, Ind., and two ice cutters; all cars are mounted on Taylor trucks, having a 7-ft. wheel base.

Before proceeding to a description of the snow storm of February 20-26, it would be well to give the City By-Laws with reference to the removal of snow, etc., from the streets.

Previous to the construction of the electric railway the City By-Laws compelled every owner of property, or the tenant, to clear the snow from his frontage to the centre of the street, at his own cost; and that in no case was he allowed to leave more than 12 in. of snow upon the roadway, or more than 6 in. upon the sidewalk; this winter the by-law was changed, compelling the proprietors or tenants to remove the snow within 24 hours after the storm had ceased, and not to leave more than 4 in. either upon the street or the sidewalk; the electric railway, by its franchise, is compelled to remove the snow from the tracks and for the distance of 2 ft. outside the same, and the company, seeing the impossibility of doing this without throwing its snow to the side of the track, and mixing it up with that of the tenant, immediately made a personal canvas and interviewed every

proprietor or tenant, and agreed with them to receive and cart away the snow so thrown, paying the proprietor or tenant a certain price per lineal foot of his frontage for so doing; this arrangement only applies to that side of the street to which the company throws its snow. The arrangement was accepted by the great majority of the residents, and as the clause in the railway company's franchise does not relieve the tenant from clearing the snow to the centre of the street, those declining to accept (less than one hundred) were allowed to take their own chances, and arrange for themselves with the city police for not carrying out the by-law. It will be seen then, that by an amicable arrangement, which appears to have given satisfaction to all concerned, the electric railway had only to get the snow off its tracks, and having done so, the proprietors or tenants took it upon themselves to remove the same; and without exception they have diligently done so, so that within 24 hours of every storm the streets from house to house were leveled, and all snow except 4 in. removed.

The photographs from which the engravings were made, except where otherwise mentioned, were taken on Saturday, February 26, and fairly represent the condition of the city streets after the storm. It must be remembered that all the streets prior to the storm were level and clear of snow, as required by the city by-laws.

No. 10. A street at right angles to the track on Ann street, in Upper Town with a roadway cut through for vehicles; the railway track is immediately in front of the horse's head.

No. 3. Place d'Armes not far from where No. 10 was taken.

No. 2. D'Auteuil street taken on Friday, February 25.

No. 4. D'Auteuil street taken Thursday, February 24.

No. 1. Fabrique street at end of St. John street, February 25.

No. 9. Artillery street, a street parallel to St. John street, but having no tracks thereon; this gives a general idea of the condition of the streets.

No. 8. Grande Allee opposite Parliament buildings.

Nos. 11 and 12. Maple avenue, this street for a distance of nearly 2,000 ft. was completely blocked from side to side to the height shown. Notice the top of lamp post just observable in the snow immediately to the right of sweeper in No. 11 and to the right of the car in No. 12.

No. 7. Dalhousie street in Lower Town.

No. 5. D'Auteuil street with sweeper passing through, taken Friday, February 25.

No. 6. Grande Allee, with sweeper at work (an instantaneous photo): snowing hard at the time; taken Tuesday, February 22.

The storm of February 20-26 commenced at 3 a. m. with a northeasterly gale, having a velocity of 48 miles an hour, and immediately four sweepers and six plows were run out; at the usual hour the regular service of cars was put out, but at 3 p. m., seeing that there was every indication of the storm continuing, one-half of the regular service was gradually withdrawn, and at midnight, the usual time for running in the cars, the balance were brought in, together with the sweepers, the last sweeper being brought in at 1 a. m., the 21st. The plows were, however, kept out all night to throw the snow further back from the tracks and thus give the sweepers a better chance. On Monday, the 21st, the storm had turned into a regular hurricane, the wind blowing 66



miles an hour, and the snow falling heavily and drifting badly; four sweepers were run out at 3:50 a. m., and men placed to shovel the snow further back on all cross streets, the cross streets being more subject to drifts; nine Walk-away plows were put into service and, notwithstanding the hurricane, at the usual hour the full service of cars was put into operation. At about 8 p. m. the plows had to be withdrawn, it being impossible for them any longer to move the snow farther back from the tracks. At this time the streets, especially the more narrow ones, were completely filled with snow, the tracks alone being clear, with perpendicular walls of snow ranging from 4 ft. to 6 ft. high on either side. At 9 p. m. it was found that men could not possibly stand out in the storm, and the cross street known as Maple avenue, at the western end of the Upper Town route, had to be

abandoned; at 9:30 p. m. Ann and D'Auteuil streets, at the eastern end of the same route, were abandoned; at the same time the Palais Hill route, and finally, at 10 p. m., all cars, sweepers and men were withdrawn, and it was with the greatest difficulty the cars and sweepers were brought into the shed. On Tuesday, the 22d, the storm still continued unabated, and the tracks being completely snowed under, it was decided not to attempt to run cars, but as far as possible to open up the tracks; consequently four sweepers were run out at 6:30 a. m., but after two hours' work, in which St. John street for a distance of about one mile, was successfully opened, it was decided to discontinue the attempt, it being found that the track, and in some places the whole street, was buried in snow from 6 ft. to 12 ft. deep. At noon, however, it was seen that to wait for the storm to



SCENES IN QUEBEC.

abate was useless, and another attempt was made, a force of 175 shovelers being employed to loosen and open up the tracks ahead of the sweepers. This time St. John street, St. Louis street and Grande Allee in the Upper Town, the Crown Street line, and the lower town lines were successfully opened by 1 a. m., the 23d, and operations were continued all night. On Wednesday, the 23d, the storm still continuing, with the wind blowing 51 miles an hour, it was decided (although a good portion of the road had been opened) that it would not be advisable to run cars; in fact it would have been barely possible for passengers either to alight or enter the cars, leaving out of consideration the fact that the streets were deserted and all business practically suspended; it was, however, decided to continue the opening up of the system, and five sweepers were brought into requisition, four to keep the lines open, and one to open up with the shoveling gang; in addition to this the nine plows were again brought into requisition to throw the snow further back and clear the streets for vehicles. Operations were continued all night, and on Thursday, the 24th, at the usual hour, cars were put into operation on that portion of the lines opened, and at 10:40 p. m. the whole of the lines were opened. On Friday, although the wind had abated, the snow continued to fall; the regular service was put into operation, but it was found necessary to keep the five sweepers continually running together with the plows until 10 p. m., when much to the relief of all hands, the storm had practically subsided, although snow continued to fall lightly until 4 a. m. on Saturday, the 26th.

The method adopted of handling the snow where it was too heavy and deep for the sweepers was to run the ice cutter, a machine peculiar to this city, consisting of a pair of shafts fastened on to a bar of steel, as per sketch, over the packed snow, thus loosening it (about 12 in. deep at a time) for the men to shovel, and for the plows to move farther back; the process was repeated until the sweeper was enabled to handle it.

The following table gives the snow fall and duration and velocity of the wind during the months of November, December, January and February last, from which it will be seen that in November snow fell to the extent of 12.7 in. on 12 different days; in December, to the extent of 12.2 in. on 21 days; in January to the extent of 31.5 in. on 22 days; and in February, to the extent of 43.2 in. on 19 days; this table is prepared from statistics kindly supplied by the Meteorological department from the observatory at Quebec, and it is generally conceded that the storm of February 20-26 was the heaviest on record during the past 40 years.

WINTER 1897-98—SNOW AND VELOCITY OF THE WIND.

Date	Snow in inches	Highest velocity		
		of the wind in Miles	Duration in hours	Mean velocity in hour
Nov. 1	0.20	46	16	31
" 3	0.10			
" 9	2.20	52	15	38
" 10	0.40			
" 12	0.20	42	19	34
" 20	0.10			
" 21	0.40			
" 24	0.50			
" 25	2.40			
" 26	0.20			
" 29	6.00			
" 30	Trace			
Total	12.70			

Dec. 1	1.60			
" 2	0.50			
" 4	Trace			
" 5	2.10			
" 7	0.50			
" 8	6.20			
" 9	0.10			
" 11	0.10			
" 12	0.10	45	36	24
" 13	Trace			
" 14	0.10	36	32	28
" 15	1.50			
" 17	0.50			
" 18	0.80			
" 21	0.40			
" 23	Trace			
" 25	0.30			
" 26	0.10			
" 27	1.80			
" 30	1.20			
" 31	0.30			

Total..... 12.20  
1898.

Jan. 1	4.70			
" 2	Trace			
" 3	2.20			
" 5	0.30			
" 6	Trace			
" 7	3.00			
" 8	4.20			
" 10	0.30			
" 12	1.20			
" 13	0.40			
" 15	2.20			
" 16	0.50			
" 17	0.10			
" 18	3.70			
" 20	0.40			
" 21	1.00	56	24	42
" 22	0.20			
" 23	5.40	58	27	43
" 24	0.20			
" 26	0.20			
" 27	0.80			
" 31	0.50			

Total..... 31.50

Feb. 1	1.90	57	28	37
" 3	0.10			
" 4	0.20			
" 5	0.40			
" 6	0.80			
" 7	Trace			
" 10	0.30	36	10	32
" 15	0.40			
" 16	11.50	55	22	43
" 17	0.20			
" 18	Trace			
" 20	2.20	48	19	38
" 21	9.00	66	24	50
" 22	9.60	57	24	51
" 23	5.50	51	24	41
" 24	0.30			
" 25	4.30			
" 26	0.40			
" 27	0.10			

Total..... 43.20

The mileage made by sweepers is as follows:

November	227.47 miles.
December	981.46 miles.
January	1,806.93 miles.
February*	2,307.29 miles.

5,323.15 Total mileage.

\*909.43 miles were made during the storm Feb. 20-26.

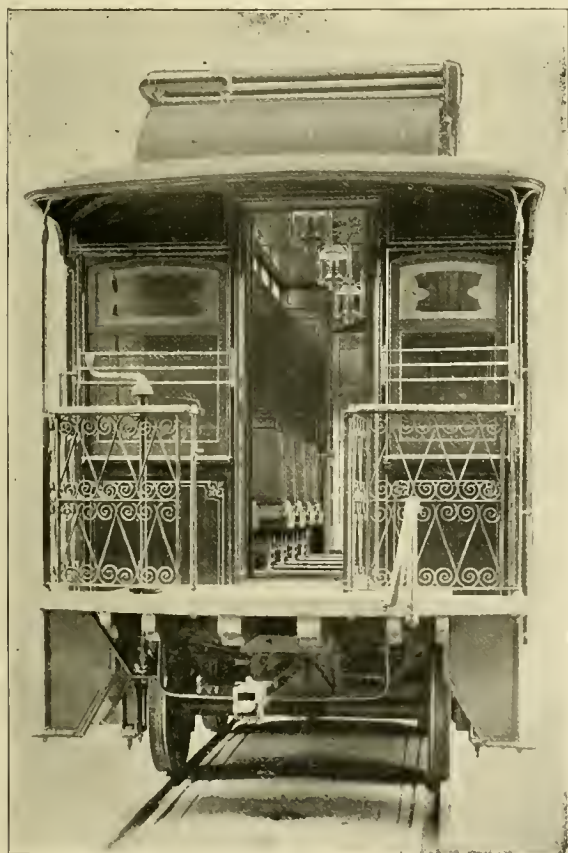
The rivalry between the steam and electric roads around Cleveland is becoming most bitter, which will likely result in further cutting of rates. It is stated that there have been several conferences of steam road officials, and it was decided that the Cleveland, Canton & Southern Railroad should make a rate of 15 cents per round trip between Cleveland and Bedford. It is probable that the steam roads will have to equip for electric traction as steam is too expensive to compete with the trolley.



## NEW MOTOR CAR FOR C. H. &amp; D.

In January, 1897, the Cincinnati, Hamilton & Dayton Traction Company was incorporated by several officers of the Cincinnati, Hamilton & Dayton Railroad, to operate rapid transit lines in connection with the latter company. There is an excellent suburban service on this railroad, and it was desired to further improve the service by increasing the number of trains during those hours of the day when the traffic is light, provided it could be done without too great an increase in the expense. It was desired to have a car with its own power plant, and the management had under consideration all the motors which have been urged as suitable for such service, finally deciding that a steam motor car would best fulfill the conditions. Accordingly a contract was entered into with the Baldwin Locomotive Works, which agreed to furnish a motor car suitable for the service. The final tests of this motor were made on the C. H. & D. tracks on February 22, and shortly afterward it was put into regular service. The photographs and description of the car were kindly furnished us by D. G. Edwards, president of the Traction Company.

The car body is 32 ft. 9 in. long over all, with a clearstory, and is divided into three compartments for passengers, baggage and the engineer. The passenger compartment is finished in quartered oak, and is provided with transverse seats



C. H. &amp; D. MOTOR CAR.

with an aisle in the center. There is seating capacity for 24 persons. This compartment is heated by steam and well lighted. The windows are provided with sash and spring rollers. All trimmings are of bronze metal. A toilet room

is located at one end of the compartment. Safety gates are provided at the sides of the back platform.

The baggage compartment is about 6 ft. long and located between the engineer's room and passenger compartment, with both of which it communicates.



C. H. &amp; D. MOTOR CAR.

The boiler is 48 in. in diameter, of the centrally fired, self-feeding type, and is supplied with fuel (either anthracite coal or coke) from the top of the car roof around the stack through a 10-in. pipe in the center of the boiler. The shell is of steel  $\frac{1}{2}$ -in. thick; there are 304 iron tubes  $1\frac{1}{4}$  in. in diameter and 5 ft. long. The working pressure is 180 lbs. per sq. in. The fire box is  $42\frac{5}{8}$  in. in diameter, and 22 in. deep. In the lower tube sheet are 12 circulating tubes, 2 in. in diameter and 8 in. long, which guide the fuel to the center of the fire box and also provide extra heating surface.

The frames supporting the cylinders and driving mechanism are embodied in a swivelling truck which forms a support for the forward end of the car. The steam pipe connecting the steam chest with the boiler is provided with flexible metallic joints to allow for the lateral motion of the cylinders caused by the swivelling motion of the truck.

Feed water is supplied by two injectors.

A four-wheeled swivelling truck acting simply as a carrier is placed under the rear end of the car and is provided with 30-in. wheels and axle journals  $3\frac{1}{2} \times 7$  in.

The steam cylinders are of the Vaucrain compound type,  $5\frac{1}{2}$  in. and 9 in. by 12 in. stroke. The driving wheels are 30 in. outside diameter. The driving wheel base is 5 ft. The driving axles are of steel with journal  $5 \times 6$  in. The driving boxes are of brass. The total wheel base of the car is 16 ft. 8 in.

A condenser is attached to the roof of the car into which all the steam from the cylinders may be exhausted. Two tanks, each with a capacity of 150 gallons, are placed under the car body, from one of which the feed water is taken, whilst the other, being connected with the condenser, receives the water formed by the condensing steam; but both these tanks are connected and supply the feed water to the boiler.

The car is provided with American vacuum brake equipment on both driving and truck wheels with upright ejector. Also, there is a pilot at the front end, one 10-in. round case headlight, signal bells, and one 14-in. gong.

The weight in working order, not including passengers, is about 48,000 lbs., of which about 32,000 lbs. are on the drivers.

The car was tested on the tracks of the Philadelphia & Reading road, and in addition to its own weight, pulled a

loaded box car. It ran a distance of 38 miles at speed varying between 30 and 40 miles an hour. The fire required no attention and received none during the entire run of 38 miles. The operation of the car was more free from noise than the ordinary trolley at that speed; rode as smoothly as a sleeping car, and the examining engineers made a very flattering report of its capacity in every way.

### VESTIBULE AT ST. JOSEPH, MO.

By the courtesy of W. T. Van Brunt, general manager of the St. Joseph (Mo.) Railway, Light, Heat & Power Company, we have received a photograph showing the vestibule which has been adopted by that company. As will be seen in the illustration, there are three sections; all filled with double strength glass, and the middle one may be pushed to one side when so desired. This sash is moved by pulling



VESTIBULE AT ST. JOSEPH, MO.

one edge in as shown in the cut, and then sliding it toward that side. This vestibule is quickly put in place or removed from the car, and does not in any way disfigure it. The only change in the car made necessary by using this vestibule was to set the brake staff back farther from the rail. The vestibules were built by a local concern and the total cost of equipping a car, including changing the brake staff, is \$28.

### A PLEA FOR GOOD VISION.

Editor Street Railway Review:

Acting upon your suggestion, I take pleasure in writing you concerning the necessity for good vision, color-sense and hearing on the part of those actively engaged in the operation of all kinds of street cars. My position as oculist to the Twin City Rapid Transit Company, of Minneapolis and St. Paul, has for many years, I think, given me exceptional opportunities for intelligent reflection upon the subject.

While the examination of locomotive engineers, firemen and others engaged in the active operation of railroad trains, for vision, hearing and color-sense, has attracted considerable attention in the world, but little, if any, notice has been taken of these matters in street railway circles. And yet if

any one *should* be in full possession of his senses it would seem to be a man who manipulates quick transit through the crowded thoroughfares of large cities. The writer is personally familiar with several distressing and expensive accidents occurring through the imperfect vision of motormen. The public has surely a right to demand that street cars should be operated with as little risk as possible to the millions of passengers carried annually. It is not desirable to injudiciously inflict hardships upon corporations, that are often already overburdened with expense and trouble, but if they voluntarily assume to operate crowded cars and trains through streets, on elevated tracks, and over railroad crossings, certain elementary requirements should rest upon them as city, state or United States obligations.

In other words, corporations should be required to have the eyes and ears of their motormen and conductors examined by a competent eye and ear surgeon. In the railroad world such examinations are required in two or three states. I think in Alabama, Massachusetts and Connecticut, and the system has stood the test of time and is commended by all parties concerned, including the employes themselves, whose lives are usually the first to be endangered in case of accident.

Many railroad systems are doing this work voluntarily, and I have recently made such examinations on the "Soo" Line with marked benefit. Many railroads make an effort in this direction by requiring examinations at the hands of division superintendents, or general surgeons; while others totally ignore their obligations in this respect. It is hoped that street railway systems will take up the work, and in order to accomplish the best results the best methods should be used. The first essential is, I believe, the retention of an experienced eye and ear surgeon, to make the tests, for while many of the cases will be of a simple nature, others will require much skill and experience to properly interpret and manage. Such matured judgment is only possessed by one whose time is entirely consumed in the care of eye and ear diseases.

The general surgeon pays but little attention to such matters, and a mere unprofessional employe of a corporation is certainly entirely incompetent. Some companies allow surgeons employed by a brotherhood or beneficiary association to make physical examinations of applicants for work. I regard this as an exceedingly questionable proceeding; for, while many surgeons are doubtless honest and conscientious, it is doubtful how far these qualities would extend when the retention of a lucrative position is involved, which might become exceedingly precarious if members of the brotherhood or association were frequently declared physically incompetent. Such examinations should be kept independently in the hands of the corporations themselves, with full ability to employ or reject those applying for positions of responsibility and trust.

I repeat, then, that eye and ear examinations should be conducted by eye and ear surgeons, and by them alone; but to render this possible, certain concessions as to detail, and pecuniary consideration, must be made by such surgeons. The details of examination for eye and ear disabilities can be made with sufficient accuracy, and a proper certificate issued, within (on an average) five minutes. Some cases will take much more time. I have in a few instances consumed hours, and several consultations, to satisfy myself as to the existence of color-blindness; but such instances are rare.



Certain simple rules should be observed in the examination of new applicants.

1. He should possess perfect eyes.
2. He should be able to easily hear ordinary conversation with each ear at a distance of 20 ft.
3. He should not be color-blind.

It is easy to find perfect men from the great horde of those seeking employment, therefore the standard should be high.

It is well to make concessions to old and trusted employes; therefore, while the rule for color-blindness and hearing should remain the same, some elasticity may be allowed in the matter of vision. The applicant should possess at least two-thirds vision in one eye and three-fourths in the other, and have no serious progressive ocular disease.

If the applicant falls below such visual standard, but can obtain it by means of properly adjusted glasses, he may be allowed to retain his position, provided he wears his glasses when on duty. The expense of an ocular examination and glasses should be met by the applicant himself, and should involve an extra fee upon the part of the oculist, although the applicant must be made to understand that he may select any oculist he chooses to perform this personal service, bearing in mind the fact that these glasses and their results must be inspected by the company oculist, in order that he may pass upon their usefulness.

I submit the little card, shorn of all bewildering technicalities, which I have been using in the Twin City examinations:

No. ....

Minneapolis, Minn. .... 189. ....

I have this day examined.....

with the following result:

Vision.....

Color Sense .....

Hearing .....

I would recommend his employment as.....

Remarks: .....

Frank Allport, M. D.

The eye and ear surgeon must also make such concessions as to price as to render his services attractive to street car corporations.

When work is in this way done upon a large scale, involving considerable money, and sure pay, the surgeon can afford to examine men at the rate of one dollar each, and I would suggest this as a proper and equitable fee. Under these circumstances the amount involved would be so small for a single company as to afford but a little excuse for not having it done. I would suggest that new applicants pay the fee themselves. I believe that such examinations will in the end prove actually economical to corporations. It is often necessary to spend money in order to save it, and this is the case in the issue at present involved. Without a doubt every corporation has in its employ a large percentage of men with defective eyes or ears; they are, therefore, fostering in their employ an enormous element, capable of leading them into much trouble, litigation and expense, to say nothing of remorse over lives lost from the employment of such defectives.

The consequence of one accident might easily much more than pay for the examination of every employe in a particular system. I am myself cognizant of a certain notable case, where an accident caused by a near-sighted motorman cost a company many thousand dollars.

Besides this it is hardly necessary to remind street railway officials that in case of accidents, involving litigation, where questions of eyesight, hearing, or color-sense are in issue; a certificate from a reputable eye and ear surgeon will possess more weight with a judge and jury than no certificate at all, or one from a division superintendent, or even a general surgeon. It will impress the court favorably to know that a street car company has been sufficiently observant of the welfare of the public to compel such examinations, and a company may often be placed in a position, after it gets into trouble, where it would be glad to pay a large sum if it only had had the precaution to have on file certificates of eye and ear health. But then it will be too late. It is like insurance; it must be taken out before fire or death.

Companies will spend fortunes to guard against trouble, and for litigation, but will neglect to surely ascertain if the man who drives a car, loaded with human freight, can see properly, hear properly, and distinguish signals properly, which could be done at very small expense.

Some ultra-practical men say that defects of the eye and ear become quickly self-apparent, and that employes thus defective will be dropped by the company or voluntarily resign through a personal sense of inability to properly perform their duties. The great army of defectives in railroad service detected under proper examinations by eye and ear surgeons, who have previously passed examinations by superintendents and even general surgeons, is an answer to this supposition. The mere fact that defective men have been able by tact and ingenuity to progress to high positions of trust is no argument against the necessity of high grade eyes and ears in such employes. The optimistic supposition that men will themselves resign, through self-consciousness of defects, while beautiful to contemplate, is found absolutely untenable in practice. I have examined many hundred railroad men. I have never found a man willing to admit a defect, or, after such a defect has been unmistakably demonstrated, willing to give up his job, even though he must see that he retains it at great risk to himself, his company and the lives and property of the public.

Improperly conducted eye and ear examinations are not only worthless, but injurious, because they engender a sense of unjustifiable security, as while many defects may and doubtless are developed under even a poor system, they cannot be depended upon for accuracy.

In the examinations made last year of the employes of the Twin City Rapid Transit Company, I found many men who from various ocular defects were absolutely unfit to have the care of cars, who were subsequently given other employment without engendering any hard feeling.

I therefore wish to emphasize what I have previously said, that companies operating surface and elevated street cars should have the eyes and ears of those employes actively engaged in operating such cars properly examined by eye and ear surgeons, as they are best able to perform such services. Such examinations will undoubtedly be of great benefit to the men themselves, the companies and the public. Respectfully yours,

Frank Allport, M. D.

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John Kean has offered to pay \$100,000 to Union county, N. J., for a franchise to build and operate a trolley line on Westfield avenue, from Elizabeth to Plainfield, a distance of 12 miles. A 20-minute schedule is proposed and the line will be divided into three sections each with a 5-cent fare.

## GLASGOW DISTRICT SUBWAY.

Glasgow is a city widely noted as being the most progressive in Great Britain. One of its great problems has been to devise a suitable traction system leading into the congested centers of business. The streets are so crowded that the speed of trolley cars would necessarily be very slow, and in many places the streets are too narrow to permit the construction of an elevated road. Hence it was thought that only an underground line would be adequate for the conditions. A company was formed in 1887 and a bill introduced in Parliament; this was defeated because of objections to driving tunnels under the Clyde. Subsequently permits were granted to construct tunnels for pedestrians and vehicles, and, a precedent having been formed, the Subway Company was successful in 1889 with its petition to Parliament.

The line is tunneled throughout its length of  $6\frac{1}{2}$  miles and is roughly oval in shape. For the most part the tunnels are under the streets, as elsewhere a private right of way had to be purchased. The average depth to the top of the

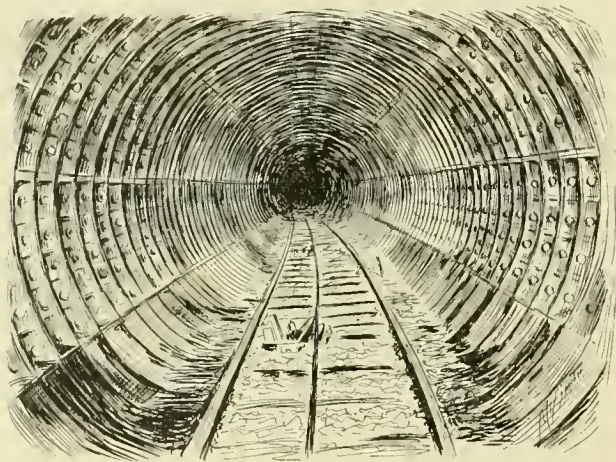


FIG. 1.—EXAMPLE OF IRON TUNNELING.

tunnels is 29 ft., the greatest depth being 115 ft. and the least 7 ft. The tunnels are practically two endless cylindrical tubes, 11 ft. in diameter, being from 2 ft. 6 in. to 6 ft. apart and connected at intervals of 75 ft. by manholes, and at the stations the tunnels are merged into one arch of 28 ft. span. The grades are not excessive, none being over 5.5 per cent, and no curves have a radius of less than 600 ft. Many difficulties were met with in the tunneling, as it was necessary to pass through shale, sandstone, coal, clay, sand and mud. One portion of the tunnels passed under important buildings and railway shops, and to avoid all risk of a collapse the construction shown in Fig. 1 was adopted. Tunneling shields were used on this section. Each ring of the iron tube is 12 ft. in diameter and 18 in. in length. In passing under the river the air pressure in the tunnel blew up the bottom of the river no less than 10 times, but the work was completed after several months by carefully regulating the pressure in the tunnel to conform with the depth of water in the river. The tunnels are thoroughly drained by brick conduits underneath, and these are emptied by means of motor-pumps.

The act of Parliament permitted the adoption of any system other than steam, and David Home Morton visited

the principal street railways in England and America in search of suggestions for the best plans to operate the subway. The decision lay between the cable and electric traction. It was thought that electric motors would require heavier cars with a corresponding increase in the weight of the track. The numerous grades gave the cable system a great advantage, as the cars going down-hill assisted in pulling the cars on up-grades at different points on the line. The cars do not depend on adhesion for tractive power and were consequently made as light as was practical. It was unnecessary to have a conduit for the cable, and this made its installation comparatively cheap. The method of carrying the cable is shown in Fig. 1, it being about 2 in. above the top of the rails. The cable is  $1\frac{1}{2}$  in. in diameter and consists of six strands of 13 to 16 wires per strand, laid on a hemp core. Each cable is 36,300 ft. long, has 600 miles of steel wire in it and weighs 64 tons. About 1,700 track sheaves are used to carry each cable and are of three types. The vertical sheaves, for straight track, are spaced 30 ft. apart; the inclined sheaves, as in Fig. 1, are for curves of large radius, and the horizontal sheaves, for sharp curves and lateral pressure only, are used in connection with the inclined ones and spaced 8 ft. 9 in. apart. The sheaves are very substantially made, as they must revolve at high speed, the cable running 15 miles per hour. The tread is 16 in. in diameter; the spindles are driven tightly into place with the ends running on magnolia metal half-bearings, the upper half being in oil boxes which are carried on a cradle, fixed to a cast iron ballast box. The inclined sheaves are adjustable to any angle from  $30^\circ$  to  $60^\circ$ . At the stations where noise is objectionable, the sheaves are so constructed that the cable runs on leather or other non-metallic packing, but as a rule they are made of the best quality of cast steel.

The stations, 15 in number, are each situated at the summit of a slight elevation, the grade on either side being  $2\frac{1}{2}$  per cent. By this arrangement the stations are brought a little nearer the surface, the up-grade assists in stopping and the down-grade in accelerating the cars. Fig. 2 represents the interior of one of the stations; the arch is 28 ft. span and 150 ft. long and about 15 ft. above the level of the rails. The arrangement of the platform and the entrance is clearly shown. The street entrances to the stations are, as a rule, through buildings erected previous to the opening of the subway. The St. Enoch station, shown in Fig. 3, is a handsome structure situated in the center of the city near Buchanan street, the most fashionable thoroughfare in Glasgow. It is of the later German Renaissance type of architecture and is built of redstone.

The power station is a building of large proportions, the engine room occupying a space 138 ft. long and 100 ft. wide, and the boiler room being 132 ft. long and 88 ft. wide. The chimney is 180 ft. high and has an internal diameter of 8 ft. The weight of the stack is 1,244 tons. At the head there are 16 air ports so formed that the wind striking the chimney is diverted upwards, improving the draft. Over the coal storage room is erected a cast iron water tank, 73 ft. long, 34 ft. 8 in. high and 8 ft. 9 in. deep, capable of holding 125,000 gals. of water. This storage is to provide for any temporary stopping of the city water works and holds enough water for two or three days. There are two 1,500-h. p. engines of the horizontal single-cylinder, non-condensing type, with Corliss valves. One of these engines is illustrated in Fig. 4. The cylinders, which are

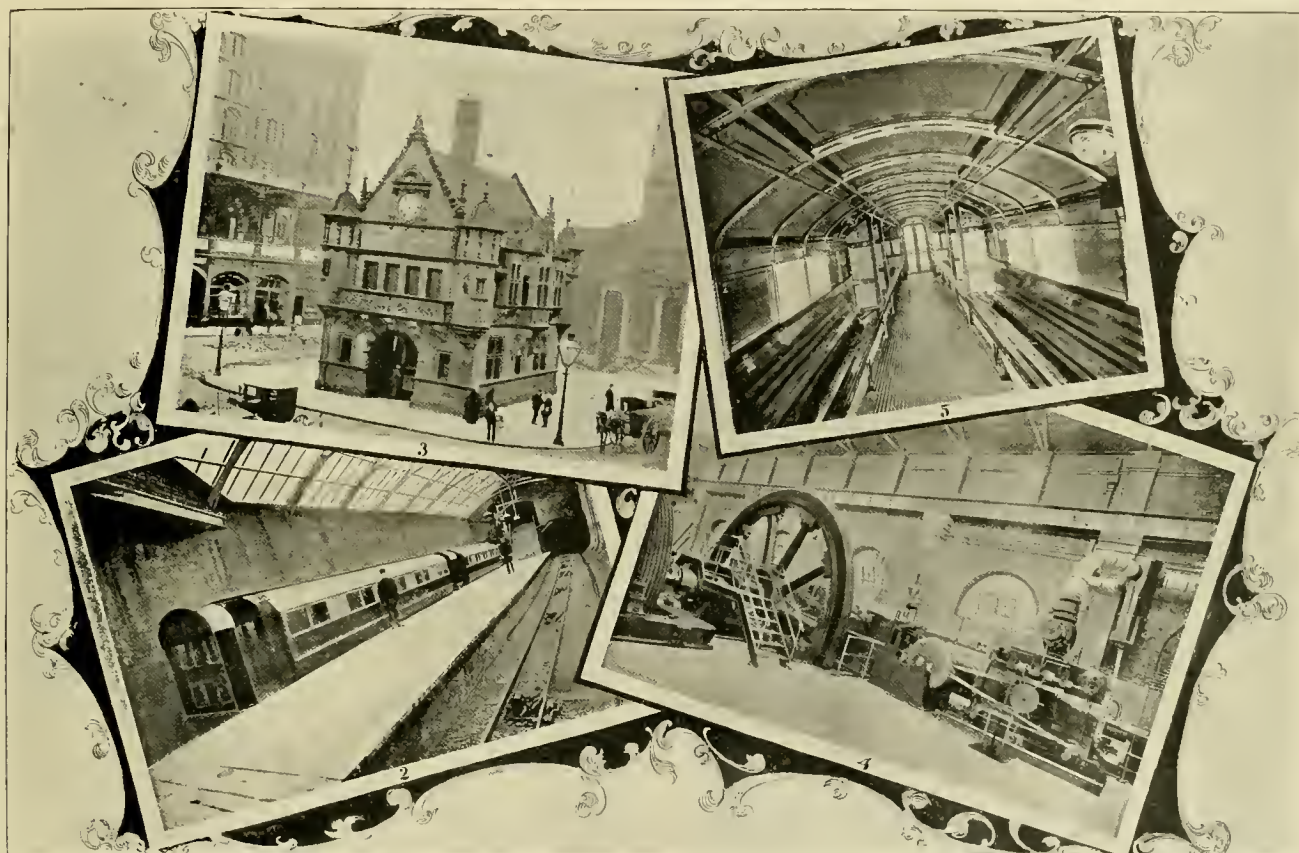


steam jacketed, are 42x72 in. and the speed is 55 r. p. m. To provide against racing two governors are in use, the larger acting on the valve-gear and the other on a throttle valve just above the main steam inlet valve. A vertical double-cylinder engine, 14x18 in., is between the two large engines to assist in starting them and also in running the cable backwards or forwards in case of repairs.

In the boiler room there are eight Lancashire boilers each 8 ft. in diameter and 30 ft. long, working under a pressure of 100 lbs. Mechanical stokers feed the coal from hoppers, into which it is distributed by means of an ele-

two lamps in front of red bull's eyes which are the tail-lights to the train. To distribute the current two conductor rails, of light T-section and bonded at the joints, are placed 6 in. apart on the inner side of the inner tunnel and on the outer side of the outer tunnel. Trolley wheels are attached to the sides of the cars and run horizontally on these conductors. Each car is fitted with these trolley wheels and when two or more cars are in a train they are coupled electrically. The track forms the third conductor in the circuit.

The passenger cars are especially designed for this line and have many unique features. The purpose was to get



2. IN COPLAND ROAD STATION.

3. ST. ENOCH STATION.

4. IN THE POWER STATION.

5. INTERIOR OF PASSENGER CAR.

vator and screw conveyors. Two large exhaust steam feed-water heaters deliver the water to the boilers at a temperature of 200° F. All the piping is in duplicate.

The car shed is a building 220 ft. long and 115 ft. wide and is built above the tunnels. The cars are run into the "car pit", an opening under the shed 28x55 ft., and are lifted a distance of 20 ft. by means of a 12-ton travelling crane. The car is then carried by the crane to any of the six lines of track for storage or repairs.

The subway, stations and buildings are all lighted by electricity. Four compound vertical engines of 129 h. p. each is direct connected to the dynamos. Two dynamos run at 540 volts and the other two at 270 volts. The current is distributed by the three-wire system and the circuit in the subway is tapped into by feeders at four different points. The interior of each car is illuminated by four incandescent lamps, the front vestibule by one 16-c. p. which also acts as a headlight, and the rear vestibule has

a car light, strong and with the greatest head-room and width inside. Fig. 2 and Fig. 5 show the proportions of the cars inside and out. The cars are double vestibuled and mounted on two trucks. The length over all is 40 ft. 9 in. and the greatest width 7 ft. 8 in. The head-room in the center of the car is 6 ft. 6 in. and the floor is 26 in. above the rails; the wheels, being 27 in. in diameter, extend slightly above the floor. There is seating capacity in each car for 48 persons.

The grip is secured to the front truck under the leading axle, and as it is desirable, on account of the small clearances of the track, that there should be no vertical movement, no springs are interposed between the truck and axle boxes. Smooth running is obtained by placing four sets of Timmis' patent steel springs between the truck and the car body. The jaws of the grip are fitted with renewable dies of rolled steel and are 2 ft. 4 in. and 2 ft. 9 in. respectively for the top and bottom jaws. Each car is



now fitted with a grip, but ultimately it is intended to have one trailer to each grip car.

Both hand and power brakes are used on the cars, the former being operated by a hand wheel in the front vestibule. The Westinghouse air-brake system is provided for emergencies with the engineer's valve in the front vestibule. The compressors are in the power station and store the air in a large reservoir at 100 lbs. pressure. Each car has small storage tanks under the seats with a capacity sufficient to make 40 stops. The whole line is operated on the absolute block system, being semi-automatic and quite simple. All the stations are connected with each other and with the power house by electric bells and telephone.

The subway was opened December 14, 1896, but the traffic proved too great for the accommodations and it was closed until January 21, 1897, when there were better facilities for handling large numbers of passengers. The regular fare is 4 cents, with special tickets at 2 cents for passage to the fourth station from the starting point.

The whole project is unique, and it is the only underground passenger cable railway in the world. And. Home Morton has written a history and description of the undertaking and published it in pamphlet form, from which we have taken the data and illustrations here given.

### THE ELECTRIC LINE IN DUBLIN.

The Dublin United Tramways Company has recently equipped its Clontarf line, three miles in length, for electric traction. The track extends from the city limits, along the sea coast of Dublin Bay, to Dollymount, a fashionable resident suburb. The track has been relaid with 7-in. girder rails, the gage being 5 ft. 3 in. Span wire construction is used throughout, supported by iron poles spaced 120 ft. apart. The poles are 29 ft. 6 in. long, built up of 5, 6 and 7-in. steel tubes. The trolley wire is No. 0, B. & S., and divided in half-mile sections. The track is bonded with No. 0000, 30-in. Chicago bonds and cross bonded at short inter-



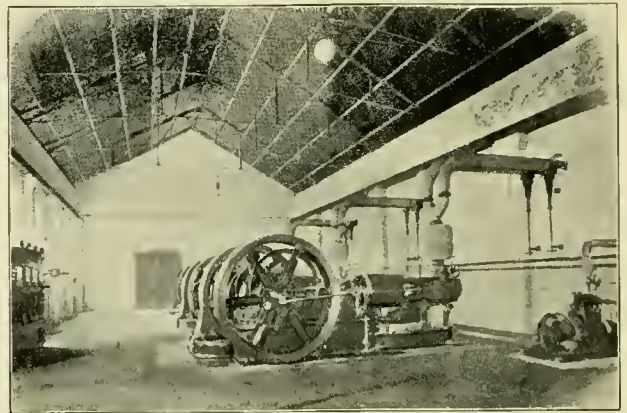
STATION AND CAR HOUSES.

vals. There are two feeders, and at each connection with the six sections there is a magnetic blowout lightning arrester.

The power station is located at the Dollymount end of the line, with the repair shops and the car barns. These build-

ings, which were formerly used for stables and barns for the horse cars, are 140x166 ft., shown in Fig. 1. Fig. 2 represents a view in the engine and dynamo room, showing three units, consisting of McIntosh & Seymour, tandem compound engines directly coupled to Thomson-Houston six-pole, 150-k. w., 500-volt generators. The engine cylinders are 11½ and 23x17 in., and the speed is 200 r. p. m. The generators are the regular General Electric type, capable of carrying a temporary overload of 50 per cent.

The switchboard, also shown in the illustration, has a panel for each generator with the usual equipment of circuit breakers, quick-break switches, etc. A Thomson wattmeter



INTERIOR OF POWER HOUSE.

records the total output of the station. The current for both the arc and incandescent lamps about the building is supplied from a four-pole, 10-k. w. Thomson-Houston generator, direct connected to a vertical high-speed engine.

Steam is furnished from three water tubular boilers of American make. A Green economiser, consisting of 160 tubes, has been installed, and the main flue from the boilers is branched so that the gases either pass through the economiser or can be turned directly into the chimney. The stack is of brick, with an internal diameter of 7 ft. and a height of 112 ft. The water supply comes through two direct acting horizontal steam pumps with a capacity of 22,000 gals. per hour. A cast iron water tank, holding 10,000 gals., and a storage tank of 38,000 gals. capacity outside the station, provide a reserve water supply during any accident to the water mains of the township. All the steam and feed-water piping is in duplicate.

At present there are in service 15 motor cars, each being double-decked and capable of carrying 54 passengers. The bodies are mounted on Peckham cantilever trucks with 33-in. wheels. The trucks are fitted with wheel guards and adjustable fenders. The controllers are the Thomson-Houston K2 series-parallel type. The motors are the G. E. 800, two to each car.

The whole installation has been designed with the view of extensions and new electric lines. It is the intention in the near future to build a line to Howth, a sea-side resort six miles from Dollymount. From the boilers to the motors, the equipment and installation has closely followed American practice, and it can be predicted with certainty that the system will be successful in operation and be a model for future electric railways in Ireland.



## PRESIDENT POLK ON PUBLIC UTILITIES.

Jefferson S. Polk, president of the Des Moines (Ia.) City Railway, recently addressed the Des Moines Union Municipal League on the question of "Municipal Ownership." In the introduction Mr. Polk said:

"It gave me much pleasure some weeks ago to note the organization of this club for the non-partisan discussion of economic questions, among which is that of municipal ownership. You have been favored with several arguments in its favor by distinguished fellow townsmen, members of the three learned professions—the law, the clergy and the college professor.

"I am here this afternoon at your invitation, for which I thank you, to present as best I may the other side.

"Before entering into this discussion, permit me to say I am not here in the interest of local politics or of either of the candidates for the mayoralty, as on the question of municipal ownership I am opposed to both; nor am I here in the interest of the street railway company, in which I am personally interested, because I feel that municipal ownership would be a godsend to the stockholders, who have as yet received not one cent of dividend or one cent of profit therefrom. I am here, however, in the interest of good government and of a people overburdened with taxes and special assessments. What I shall say will be a plea of a citizen in behalf of a city we all love, whose progress has been checked and its every interest blighted by bad politics and by unjust and ruinous taxation."

The subject was discussed at length and we have space for only a brief abstract. It was pointed out that to acquire what are called the "public utilities," a city must either purchase existing plants or build new ones, in either case, only by incurring a vast debt, to be met by taxation. And while the burden of taxation is upon all having property, the advantages claimed in the way of reduced prices (which, in the light of experience in similar ventures, are thought to be mythical) can be at the service of only those who can afford the luxuries, and these constitute a limited portion of even property holders. The benefits from municipal ownership can accrue to but two classes, the office-holder and the rich.

All "public utilities" require skilled management. It is no disparagement to our city officers to say that they are not now and never will be competent for the successful management of these utilities, and disaster and ruin will follow, not from dishonesty, but from ignorance. Men are clothed with municipal office who have no knowledge or training for the duties they are expected to perform. As evidence of the deplorable condition of city governments quotations were made from speeches at recent conventions of good government clubs. Since the past has demonstrated that we cannot have civil service regulations that are effective, the only remedy left for the people from the crying abuses and wrongs in the administration of a municipality, is to strip the municipality of all powers and functions not strictly governmental, and prevent it from entering the domain of private business and speculation.

Municipalities have not found the operation of "public utilities" profitable. The recent action of Philadelphia in leasing the gas works to a private company and the history of numerous municipal electric light plants were cited in support of the proposition.

In conclusion the results of the municipalization of street

railways in Europe were considered and the difference in conditions here and abroad noted, and the effect on the distribution of population of the development of the street railways along American lines pointed out.

## PHYSICAL AND CHEMICAL PROPERTIES OF VOLATILE OILS IN BOILERS.

An address before the Northwestern Electrical Association by W. H. Edgar.

It is my purpose to speak on the subject of the use of volatile oils, hydrocarbons, kerosene, and oils of that nature, in the steam boiler. I do not believe there are any cases in this country where we get petroleum or other oils in our feed-water supply, but the general laws of nature are such that our waters are heavily impregnated with lime and magnesia, which are the main ingredients, the scale-forming salts, which form an incrustation in the steam boiler, which incrustation is a poor conductor of heat as compared with iron, so that we are forced to look around for something to counteract the evil effects of this incrustation and to get rid of it if possible. This has led us to put most everything into our steam boilers, and among the different reagents employed have been volatile oils. I know that they have pumped turpentine and resinous oils into boilers up in the lumber districts; because they found in districts where they were sawing hemlock and oak that the sap and washings from them have apparently kept the boilers clean; so they thought that if they put a little of the product they were working on into their boilers it would have the same effect, it all being vegetable. These volatile oils, including turpentine and oils of that nature, are all hydrocarbons, and when they have been put into steam boilers have caused a corrosion or general eating and deleterious effects upon the boilers from their use. In the oil fields, years ago, they put in what they called an oil brick, made from petroleum, and that was not successful; in the last few years they have been in the habit of pumping into the steam boilers kerosene, etc. I know of one man in Chicago who is at the head of some six or eight large plants belonging to one of the largest corporations we have in the city of Chicago, who put naphtha or gasoline into his boilers for years, and would persist in saying that it did the work to perfection; but he had to stop using it, due to the leaks, etc.

There are two ways of looking at this subject of incrustation and its proper antidotal reagents. A boiler is very much like the human system. We are liable to injure it, and we are liable to put something into it where the after effects are worse than the disease; so we must take up both sides of the question. Now, I want to bring out a few points about volatile oils and kerosene. Kerosene is a light distillate hydrocarbon, and has been used very extensively throughout the country, or tried here and there, and dropped for one or another reason; and I will offer these suggestions and take up these points without any personal motive whatever, for I have none; but I will just simply take up the evil effects of kerosene and petroleum and their different distillates.

Kerosene pumped into the steam boiler with the object of converting the incrustation into such form that we can readily wash it out, or prevent its formation, I shall consider in the first place. Kerosene is a hydrocarbon. If we had a carbohydrate, an animal oil, we would get an

oleate radical and could possibly get the oleate of lime or oleate of magnesia, which, however, would not help us out; but we could get a chemical reaction from carbohydrate, having a combining acid radical there; but in the hydrocarbons we have no possible acid radical; we have not the base; we have not the combination that will take the place of either base or an acid radical, and we get no chemical reaction whatever, and the action of the kerosene is purely mechanical, following the laws of capillary attraction. If I dip a blotter into water, the water will run up the side and penetrate the blotter; if the blotter is set over a tumbler of water the water will penetrate through the substance of the blotter; and if you play a hose on a brick wall the moisture will penetrate to the other side. Now, kerosene, being a light volatile oil, will penetrate everything of a porous nature, such as lime, magnesia, etc., and will penetrate to a greater extent and more rapidly than water. The scale incrustation in the boiler will be softened, will be penetrated by this kerosene, due to the laws of capillary attraction; the scale being porous, the kerosene will work through to the iron, and when it comes in contact with hot metal the oil will run back of the sheet of the scale, between the scale incrustation and the iron, and when you shut your boilers, draw your fires and let out your water, your boiler contracts, the iron contracting and expanding with the application of the heat. Now, you have put a substance of different physical properties, of a different nature, between your lime and magnesia incrustation and your iron sheet or plate. The lime and magnesia, little particles of them, will attach themselves to the sheet, due to the general affinity that they have for hot metal; they cling very tenaciously to the iron, and when this substance comes in between, you have lessened that adhesive property, and the incrustation is not adhering as tenaciously, and, consequently, being a non-conductor and not expanding and contracting uniformly with the iron, it is more readily scaled off, and you get a great quantity of this broken scale from the continued use of a volatile oil such as kerosene. The kerosene does not change the chemical composition of the scale; its action is purely mechanical.

There are other points to be considered. Kerosene volatilizes in the steam boiler; you get probably a third over with your steam; it passes off immediately and begins to come over from about 150 degrees to 300 degrees Fahrenheit. The kerosene that passes over constitutes hydrocarbon distillate, and your steam is hydrogen and oxygen, and you know the evil effects from condensation in a steam plant; you know that every year you have in your heating system to put in a few more nipples or an elbow here and there. When you put in a light volatile oil of a hydrocarbon nature, you intensify that action, you get a series of oxidizing hydrocarbon reagents that will intensify that general pitting and grooving 100 per cent; that is, you will get the general eating through of the joints and connections probably twice as quick as you would otherwise. Besides that, the kerosene carries over into your cylinders. It is a part of the cylinder oil in the first place; the cylinder oils all come from petroleum, except the animal oils. The kerosene is a solvent for them. It dilutes your cylinder oil; it has a tendency to change its lubricating properties just that much, and with the hydrogen and oxygen of the water and the compound formed in the distillate you will get blackening of your piston rods and deleterious general oxidizing

effect on your rings, and if you have a metallic packing you will have hard work keeping your packing in your engine. From these same distillates, these same products formed in your distillation, you will have the pitting and the general eating through of all the threads of your joints and connections through your entire steam system. Not only that, but the part that is left in the steam boiler and the part that goes through your scale and reaches the iron cannot stand that high heat. It is carbonized; it is all decomposed, and in the carbonizing of the hydrocarbon oil in the presence of iron or against the iron sheet, you are going to carbonize your iron, and you will have there a blistered-appearing spot where the iron has been carbonized; it will be of a blackish, blistered appearance, and you will get that action all through the water-submerged part of your boiler. You will never get all your scale out with kerosene; you will never get more than a third, and those who are using kerosene and claim that it is working well simply look at the scale that they take out and do not look in the boiler to see what is left. In my travels I have had some of my best friends tell me that they have used kerosene and their boilers are clean, their system is in good shape; and I have gone down to their plants, and looked around, and in the steam system, from the boilers to the engine, I have seen the little leaks; and when this leakage does start in and a flange gives out and you have to put a new one in, in taking that apart you jar the whole system and bring to sight more leaks where your piping is half-eaten through and almost ready to leak. Of course an old plant will show up leaks in a few months or a year, but a brand-new plant will disclose leaks in time, if you continually use kerosene.

Now, why do people want to use kerosene? It is generally the man up at the office end of the institution that clings to the practice; it is generally the superintendent or the manager that advocates kerosene, because, he thinks, it costs nothing; he is getting something for nothing. That is where so many men have made a mistake, even in the running of large enterprises and large businesses. One of the greatest dangers is to look for something for nothing. You cannot get something for nothing and you cannot get any man to run his business without profit. This is true of boiler compounds. In the use of them the modern steam-plant owner is far behind all other branches of science. If you will, in using kerosene or using any volatile oil of that nature whatever, take the subject up and look into it for yourselves, you will find that the deleterious effects, the general carbonizing and pitting, the general eating away of that thin, natural skin of the iron (the finish, as it comes from the boilermaker) is a dangerous thing. It takes several years to scale a boiler to start with, on a fairly good water, but if it is scaled once it will scale again in three months, because the skin of the iron is gone. When the skin of the iron is once gone the scaling ingredients readily attach themselves to the rougher iron; while in the new boiler they cannot adhere as rapidly as they can in the boiler where the skin is gone.

In the course of the discussion of the subject which ensued Mr. Edgar explained the action of pure water on the boiler and the effect of vegetable compounds in preventing scale.

The corrosive action of pure water on iron is purely an oxidation with the aid of hydrogen. There is a pitting and



grooving of the iron, and many of these pits have a scab or the appearance of a scab. If you tap that off you will find underneath a little raw sore, you might say, a hole eating through the skin of the iron, a pit hole, and in that hole you will find a red powder, which is the ferric hydrate. By boiling this it is converted into the oxides, finally going into black magnetic oxide of iron, and is found in the bottom of the boiler. Water is the greatest solvent known to chemistry. We have no artificial liquid or anything produced by nature that is as great a solvent; it must take up something to keep it satisfied.

We often pump water into a heater and get pitting in the heater and not in the boiler, which is due to lack of circulation, and the freeing of the air and oxygen held in the water, and it is almost a direct oxidation in that case; but we get a more rapid oxidation in the presence of pure water. It is in an unsatisfied condition, and the iron is taken up as a hydrate, and from that to an oxide. When the water of condensation is used again, if something could be introduced into the condensing system where the condensation begins to take place to satisfy it, the corrosive action might be stopped, but there is no way known of doing this.

Of vegetable compounds we use sugars and tannins only, and in this way: We find that we can take care of the carbonates of lime and magnesia with tannin extracts, and do not want the extracted tannic acid. The object is to convert the carbonates of lime and magnesia into tannates, and pure tannic acid is too stable in itself to be readily converted into tannates. We cannot work on gypsum, the sulphate of lime, with tannin. Gypsum is one of the four insoluble sulphates, and is so stable in itself that it is not even soluble in its own acid.

Sugar introduced into the steam boiler with the water will convert the sulphates into saccharates. The saccharates break up into oxalates, tartarates and carbonates; and in the presence of tannin extracts part of that goes into tannate of lime; so that we need but a small proportion of sugar present in the general mixture to handle a water containing both the sulphates and the carbonates. The proportions of the sulphates and carbonates in the water are to be determined by analysis.

The boiler compound should be introduced into the system as early as possible. The tannins in the extracted form and blended with the sugar give no tannic acid reaction, and no action on the metals. Using a vegetable mixture of this kind will keep the gaskets pliable. It is always well to mix a little slippery elm and pokeroor or powdered willow hardwood pulp, so as to get a little soluble wood starch and keep the sugars from being too stable and the tannins likewise, and thus get readily convertible tannates and saccharates.

A surface blow-off contrivance is very good, but the trouble with such things is that they are expected to do all the work, and sufficient interest and care is not usually taken in their application by the engineer. The boiler is too often neglected, and it cannot get up and speak its little piece like the engine, when anything is wrong.

Do not forget to treat the boiler regularly. Put in whatever you use regularly. Have the water analyzed, and go to the wholesale druggist and he can mix up the tannins and sugars in proper proportions; but do not use any soda. Some sulphate waters require considerable starch, slippery elm, etc.; they sometimes use 5 or 6 per cent of carbonate of soda, boiling it; that goes to kill the gelatine properties, and

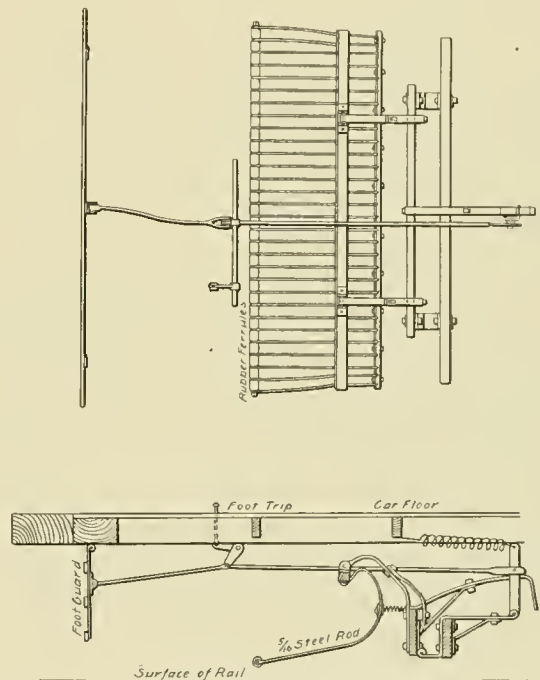
then when you introduce your tannin extract the soda produces tannates of soda, 5 per cent tannate of soda, 20 per cent of sugar and 50 per cent of tannins. The steam users in the country should look into this thing and should study their boilers.

The greatest point in regard to compounds is the care given to the boiler.

### THE DOUGLAS FENDER.

We have received from General Manager Vining the accompanying drawings of the fender with which the cars of the Market Street Railway Company, of San Francisco, are now being equipped, and which is one of three approved by the Board of Supervisors. The fender was designed by G. W. Douglas, foreman of the company's car repair shop, who has applied for patents on it.

The fender is carried in front of the truck and the basket or scoop consists of curved steel rods 5-16 in. in diameter,



THE DOUGLAS FENDER.

It is ordinarily carried so that the front edge is a few inches above the level of the rail and is dropped either by the motorman pressing the foot-trip or by the front guard striking the object to be picked up. The front edge of the scoop is provided with rubber ferrules.

The borough council of Shamokin, Pa., has made some exacting demands on the street railway company regarding the paving of streets and the board of directors of the company decided to abandon the road rather than comply with the demand.














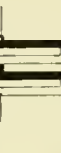
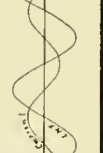

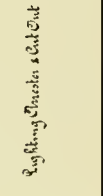
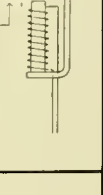
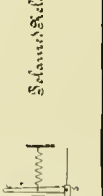
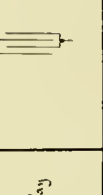
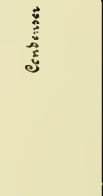
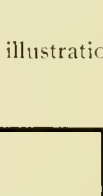
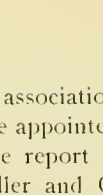


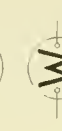
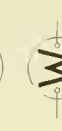
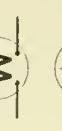




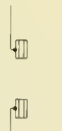

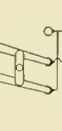
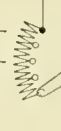

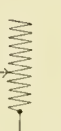
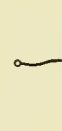








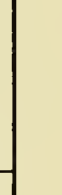

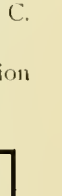

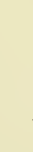
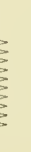



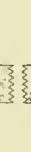
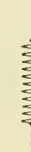
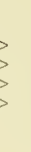




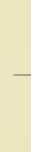


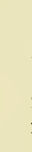
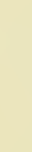
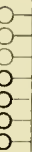
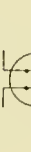
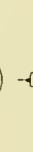
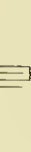

The stock of the Westport (Conn.) & Saugatuck Street Railway Company is being purchased at the rate of \$10 per share by New York capitalists, who, when the road is under their control, will make some important improvements and extend the line to Norwalk and Danbury.

## STANDARD CONVENTIONAL ELECTRICAL DIAGRAMS.

In January, 1897, D. W. C. Tanner read a paper before the Chicago Electrical Association on the subject of "Conventional Diagrams of Electrical Apparatus," and forcibly

presented the need for a standard system. The association took the matter up and the report of a committee appointed at that time has recently been published. The report is signed by Thomas G. Grier, Kemster B. Miller and C. Wiler.

The committee believes that the diagrammatic illustration

<p>NOTE: UNDER EACH OF THESE DIAGRAMS INSERT THE LETTER Q IN THE CIRCULAR SYMBOL, THE LETTER M IN THE RECTANGULAR SYMBOL &amp; THE LETTER W IN THE LETTER W</p>	<p>Dynamo or Motor</p> 	<p>Alternator Generator or Motor</p> 	<p>Series Wound Dynamo or Motor</p> 	<p>Shunt Wound Dynamo or Motor</p> 	<p>Compound Wound Dynamo or Motor</p> 	<p>Six Phase Dynamo or Motor (Star Connection)</p> 	<p>Six Phase Dynamo or Motor (Triangle Connection)</p> 	<p>Diodes Generator</p> 	<p>Battery</p> 	<p>Storage Cell</p> 	<p>Magneto Generator</p> 	<p>Compound Dynamo Magneto</p> 	<p>Shunt Electric Generator</p> 	<p>Current and Self-Excited (Alternating)</p> 	<p>Resistor</p> 	<p>Variable Resistance</p> 	<p>Single Pole Circuit Breaker</p> 	<p>Double Pole Circuit Breaker</p> 	<p>Lighting Circuit and Cut Out</p> 	<p>Relay</p> 	<p>Differential Relay</p> 	<p>Solenoid Relay</p> 	<p>Resistor</p> 				
<p>Commutator</p> 	<p>Wattmeter</p> 	<p>Wattmeter</p> 	<p>Solenoid Indicator or Subammeter</p> 	<p>Switch</p> 	<p>Knife Switch - Closed</p> 	<p>Knife Switch - Open</p> 	<p>Pole Changer</p> 	<p>Rheostat</p> 	<p>Variable Resistance</p> 	<p>Fuse</p> 	<p>Single Pole Circuit Breaker</p> 	<p>Double Pole Circuit Breaker</p> 	<p>Lighting Circuit and Cut Out</p> 	<p>Relay</p> 	<p>Differential Relay</p> 	<p>Solenoid Relay</p> 	<p>Spring Jack</p> 	<p>Slug</p> 	<p>Shell</p> 	<p>Solenoid Shell</p> 	<p>Self-acting Commutator or Tap</p> 	<p>Locking or Ringing Relay</p> 	<p>Commutator or Tap</p> 	<p>Telephone Jack</p> 	<p>Sound Receiver</p> 	<p>Sound Receiver</p> 	<p>Resistor</p> 
<p>Inductive Resistance</p> 	<p>Solenoid</p> 	<p>Coil</p> 	<p>Induction Coil or Transformer</p> 	<p>Self-acting Relay</p> 	<p>Self-acting Relay</p> 	<p>Crossing Wire</p> 	<p>Joint Wire</p> 	<p>Ground</p> 	<p>Oil Lamps</p> 	<p>Incandescent Circuit</p> 	<p>Incandescent Lamp</p> 	<p>Embosses</p> 	<p>Resistor</p> 	<p>Resistor</p> 	<p>Resistor</p> 	<p>Resistor</p> 	<p>Resistor</p> 	<p>Resistor</p> 	<p>Resistor</p> 	<p>Resistor</p> 	<p>Resistor</p> 						



of electrical apparatus should be reduced to an art, and points out that there should be a uniform system or code in which each piece of apparatus should have its own diagram, clear and simple and at the same time suggestive of the thing it represents. The improvement made in recent years in this line is largely due to the efforts of the electrical divisions of the Patent Office and to a number of patent attorneys. No attempt at originality was made in selecting the diagrams recommended, the aim being to adopt the best, whether in common use or not. In commenting on the diagrams, the committee says in part:

The representation of a dynamo or motor by a circle with two tangent lines showing the commutator and two brushes has long been in common use. This form of diagram may be used for any direct current machine in drawings where the form of the winding of the machine is either well understood or is not essential in the system to be represented. Similarly, the figure below it may be considered the generic alternator. Where it is necessary to show particularly the kind of a machine, the field coils may be added, as shown in the next three figures, which are so simple that they can not be misunderstood by one accustomed to read electrical diagrams. The diagram of the tri-phase dynamos or motors are shown by the characteristic windings of their armatures only. Where there is room for a doubt as to whether one of these diagrams represents a motor or a dynamo a letter M or G, as the case may be, will clearly distinguish them.

The diagram representing the motor-generator will, perhaps, be subject to adverse criticism. In its adoption, good perspective is undoubtedly sacrificed for ease in drawing, but who can say that the diagram is not suggestive of what it is intended to represent?

The differentiation of the diagrams for the primary battery and for the storage battery from each other and from the ordinary diagram for a condenser, has been the subject of a good deal of thought. The primary battery diagram is the one in ordinary use. The storage battery diagram differs from it by having the plates connected in multiple, as in practice, and by the drawing of a square around it. This diagram will hardly be taken as representing a condenser, for the reason that the lines representing the plates of the battery are made thicker than those connecting the plates to the battery terminals.

The reason for not representing the ordinary hand magneto-generator and the constantly driven generator by the same diagram, is that a need actually exists for a distinction between them. This is especially so in diagrams of telephone exchange systems where it is often difficult to distinguish between the hand generators at the subscribers' stations and the power generators at the central office.

In the matter of single and double-circuit breakers, many forms of diagrams were considered, each of which would probably have their advantages in certain places. This brings out well the fact that these diagrams must be taken merely as a guide, and not as a rigid code which must be absolutely followed. For instance, if it were essential that the circuit breaker should have an operating coil in each of the line wires, then it must be left to the designer or illustrator to make his own diagram for illustrating the particular case in hand.

On the simple telephone diagrams, but little comment is needed. It would be well if all would adopt the form of transmitter shown, from the fact that its construction is so extremely simple.

The listening and ringing key for telephone switchboards is a simple representation of one of these pieces of apparatus in common use. The remarks made concerning the cut-outs will apply with equal force to these.

Two diagrams for polarized bells have been shown. The one on the right hand side is preferable where its meaning can not be mistaken. The almost universal adoption of this form of diagram has led this committee to show it here, although unless one is familiar with polarized bells in telephone work it must be said that it is not at all suggestive. In cases where it is thought best to be extremely explicit, or where the immediate context of the diagram does not suggest the use of a polarized bell, the diagram on the left is to be preferred.

The diagram for a polarized relay is, it is believed, given here for the first time. By changing the plus and minus signs from one side of the armature to the other, it may be indicated that the relay will close on a minus current and open on a plus current, or vice versa. This is a feature which will be found at times very convenient.

The distinction between the ordinary resistance and inductive resistance is both simple and suggestive, the presence of the core inside of the coil conveying to the mind the presence of a certain amount of self induction.

The use of two parallel zigzag lines for induction coils or transformers, lends itself readily to the distinction between the primary and secondary, between the step up and step down transformers, and, moreover, its construction is of such a simple nature, that it was chosen without hesitation by this committee from among dozens of other good diagrams for representing the same apparatus.

In the telegraph sounder the magnet coil has been represented in outline. In this connection it may be said that where it is not essential to know the nature of the winding or the direction of the convolutions, this same form of magnet might be adopted in any of the relays or annunciators used elsewhere in these diagrams.

The difficulty in selecting a symbol for "a ground which might be universally accepted" is apparent. This custom of some artists of placing palm trees and grass, or the drawing of miniature landscapes surrounding their ground wire may add somewhat to the artistic effect, but certainly nothing to the clearness or merit of their work.

In conclusion it may be said that it is believed that where any particular piece of apparatus is to be presented for which no specific diagram is here found, it will be an easy matter for the person desiring such diagram to make it from the elements here shown.

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### IMPROVEMENTS IN MEADVILLE, PA.

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The new power station for the Meadville Traction Company is near completion, and the electrical machinery is being installed. Work will soon begin on the Edinboro line and at the Ponce de Leon Springs Park. It is the intention of the company to make this a very attractive summer resort. The buildings will include a dancing pavilion, a dining-room, passenger station, band stand and numerous rustic structures.

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The British Columbia Electric Railway Company for the period from April 15 to September 30, 1897, reports a surplus of receipts over working and office expenses of \$11,500.

### SUNDAY CARS IN NOVA SCOTIA.

In December, 1897, an attempt was made to prevent the Halifax Electric Tramway Company, Halifax, Nova Scotia, from running cars on Sunday. A citizen filed a complaint before a magistrate alleging that the Tramway Company, by directing one of its motormen to operate a car on Sunday was "guilty of performing servile labor on Sunday," which had been made an offense by the provincial legislature. The company appealed to the supreme court of the province for an order prohibiting the local magistrate from proceeding to adjudicate upon the complaint.

The supreme court decided in favor of the company on technical grounds. The amendment making a person or corporation guilty of "performing servile labor on Sunday," when he or it caused or directed any of his or its servants or employes so to do, was held to be an amendment of the criminal laws. By the British North America act the criminal law of Canada was placed within the exclusive legislative authority of the Dominion parliament, and hence the attempted amendment by the Nova Scotia legislature was held invalid, and the prohibitive order was granted.

In the opinion of the court it was pointed out that the province might perhaps secure the same end by proper legislation under the head of "property and civil rights," but that in this case it had attempted to do so under the head of "crimes," and was therefore without authority.

### FUNERAL CAR FOR THE STORAGE BATTERY ROAD.

The Chicago Electric Traction Company has received a handsome special car which will be used chiefly for funerals, but its design and decorations are such as to make it adaptable for any purpose where a special car is desired. It is finished in solid mahogany, with handsome carpet and draperies, the latter being so arranged that the car may be divided into compartments if so desired. The seats are fine



FUNERAL CAR IN CHICAGO.

antique copper wire chairs with polished mahogany bottoms and can be arranged for any occasion as they are not fastened to the floor. The vestibules are built with a large door directly in front of the car door, so that when used for funerals the casket can be readily taken in and withdrawn. As may be noted from the illustration showing the interior it has the appearance of an elegant parlor car. An effort has been made to prevent its having a particularly funeral-like aspect. The car is known as the "Virginia," and is of

attractive external design. The car is equipped with two 50-h. p. Walker motors, and will run, with one charging of its batteries, a distance of 25 miles.

There are four cemeteries along the lines of the company,



VIEW OF INTERIOR.

three of them, Mt. Greenwood, Mt. Olivet and Mt. Hope, being on the Morgan Park branch. Arrangements have been made with the managers of the various railways connecting with the Chicago Electric Traction Company to permit this car to run over their lines, which gives a direct route to the cemeteries from any point in the southern part of the city. As the car is operated from its own batteries it is immaterial whether the route be over the trolley or cable tracks.

### PROPOSED ELECTRIC LINES IN CANADA.

A. J. Corriveau, well known to the street railway world, and especially to those who attended the convention at Montreal in 1895, by reason of his connection with the Montreal Park & Island Railway Company, recently made an important speech at a banquet of the Canadian press, in which he foreshadowed the early construction of a network of electric lines between Montreal, St. John's and the Townships, and stated that a number of the lines would be commenced the coming season.

Mr. Corriveau is also interested in a project to build a 14-ft. canal, connecting the St. Lawrence river and Lake Champlain; application has been made to the Dominion parliament for an act incorporating the Montreal & Lake Champlain Canal Company.

In spite of the bad weather, the running of Brooklyn Rapid Transit cars over the Brooklyn bridge has resulted in an increase in gross earnings of about \$1,400 daily.



## STREET RAILWAY LAW.

EDITED BY FRANK HUMBOLDT CLARK, ATTORNEY AT LAW, CHICAGO.

*Forfeiture of Franchise for Failure to Operate Street Railway.*

Entire failure to operate a street railway for three years when the ordinance under which the franchise was exercised required cars to run sixteen hours every day in the year constitutes a non-user which forfeits the franchise.

A contract that non-user of street railway tracks for any specified time shall not operate as a forfeiture of the franchise cannot be made by a city, either by ordinance or otherwise, since this would involve an authority to grant the right of the use of streets for private purposes.

The opinion of the Court is in part as follows:

The question then arises, was the non-user of the franchises by defendant company under the circumstances disclosed by the record sufficient to justify the court in declaring their forfeiture? In considering this question it may be said that the insolvency of the corporation is of no importance except in so far as it may have a bearing upon the question of abandonment of its franchises by defendant, for, if defendant continued to discharge its duties to the public, it makes no difference whether it was solvent or not. Were it otherwise, very many corporations might be ousted of their franchises at any time to the great detriment of the members thereof, as well also as the general public for whose benefit public corporations and franchises are presumed to be granted. The sale, however, by the defendant company of all its rolling stock, and its failure to operate its road for a long time, and then not in accordance with the terms of the ordinance, tended very strongly to show an abandonment by defendant of its franchises. But whether there was an abandonment by defendant of its franchises or not, the evidence clearly shows that the ordinances granting the railroad company the franchises were never complied with. Electric cars were run for about three months, and then steam cars, which it had no right to run, except upon the eastern extension of the road. It ran steam cars for about eighteen months, and for three years next preceding the trial it did not operate its road at all, while under the ordinances, its cars were to be regularly run not less than sixteen hours per day during every day in the year. In the case of *Roanoke Investment Co. v. Kansas City & S. E. R. Co.*, 108 Mo., 50, it is said: "But while it is true that mere non-user will not amount to an abandonment, it is well settled that an easement acquired by grant, or its equivalent, may be lost by abandonment. To constitute an abandonment of an easement acquired by grant, acts must be shown of such an unequivocal nature as to indicate a clear intention to abandon. *Curran v. Louisville*, 83 Ky., 628; *Dyer v. Sanford*, 9 Met., 395, 43 Am. Dec., 399; *Hayford v. Spokesfield*, 100 Mass., 491. It is said, however, that abandonment will be more readily inferred when the easement was granted for public purposes than when it was created for private use." In *1 Beach on Private Corporations* (Sec. 45), it is said: "It is conceded that a corporation may forfeit its charter or franchises for willful mis-user or non-user thereof. For it is a tacit condition annexed to the creation of every corporation, that it shall be subject to dissolution by forfeiture of its franchise for willful mis-user or non-user in regard to matters which go to the essence

of the contract between it and the state." On the same subject *Morawetz on Private Corporations* says (Sec. 1018): "It has accordingly been held in various cases, that, if a corporation has assumed the performance of duties for the benefit of the public generally, it cannot neglect the performance of these duties without incurring a forfeiture of its franchises. Thus it is the duty of a corporation chartered to build a turnpike road to maintain its road in repair as a thoroughfare for the public use. . . . The same rule undoubtedly applies to other corporations of a similar character, such as ferry and bridge companies, canal companies, gas companies, etc." The generally accepted doctrine is that the omission of an express duty imposed by the charter of a corporation is cause for its forfeiture, and in such circumstances the sovereign who granted the charter may insist on resuming the grant for breach of the duty imposed. *Com. v. Commercial Bank*, 29 Pa., 389; *Atty. Gen. v. Petersburg & R. R. Co.*, 6 Ired. L., 456; *Erie & N. E. R. Co. v. Casey*, 26 Pa., 287. And where there has been a willful mis-user or non-user by a corporation, it is subject to dissolution by forfeiture of its franchises. *Mumma v. Potomac Co.*, 33 U. S., 8 Pet., 281, 8 L. ed., 945; *Terrett v. Taylor*, 13 U. S., 9 Cranch, 51, 3 L. ed., 653; 38 L. R. A. *Chicago L. Ins. Co. v. Needles*, 113 U. S., 574, 28 L. ed., 1084; *People v. Broadway R. Co.*, 126 N. Y., 29. "The rule in regard to acts of mis-user and non-user is that they must relate to matters of the essence of the contract between the sovereign and the corporations, and we see no reason why that rule should not be applied in the present case. Where duties are imposed upon a corporation from motives of public policy, a total neglect of the duty justifies a judgment of forfeiture." *State Atty. Gen. v. Wood*, 13 Mo. App., 139; *Harris v. Mississippi Valley & S. I. R. Co.*, 51 Miss., 602. One of the duties imposed upon defendant by ordinance, which it accepted, and in which the public had an interest, was to run its cars sixteen hours every day in the year, with which there was no compliance on its part, but a total neglect of its duty; hence non-user. It was held in *State, Whitecotton v. Hannibal & R. C. Gravel Road Co.*, 37 Mo. App., 496, that quo warranto would lie where a corporation is charged with mis-user or non-user of its franchises.

But it is insisted by defendant that relator is estopped to maintain this action upon the grounds: First, that by its military force it prevented the company, and still prevents it, from completing its contract, and entering on the enjoyment of its grant; second, that the city, by its common council, passed an ordinance repealing, or attempting so to do, the grant made to defendant; third, that relator compelled the defendant to tear up its turntable, and by reason thereof necessitated and required the defendant to change its equipment, and to dispose of the equipment purchased by it, and then in use; fourth, that relator, by litigation instituted before defendant ceased to operate the road, rendered impossible the operation of the road on the part of defendant, and is, by reason thereof, estopped from taking advantage of its own wrong. With respect to the first proposition, *W. J. Smith*, president of defendant company, testified, that,

even if the city had allowed the company to lay a track from Main to Walnut streets, it would not have done the company any good until it got some right of way from the Metropolitan from Walnut to Grand avenue, which it never succeeded in doing. It seems that Fifth street between Walnut and Grand avenue, upon which there were at the time two parallel tracks owned by the Metropolitan Street Railway Company, is only 30 ft. between the curbs, and that there was no room for another track; hence, unless the defendant company could in some way have acquired the right to use the Metropolitan tracks, that part of the route from Main to Walnut, even had it been constructed, would have availed nothing; therefore no justification or excuse for not operating the road. Nor do we see how the fact that the city may have passed an ordinance repealing, or attempting to so do, the grant made to defendant could have afforded it any excuse for non-compliance with the ordinances. It is well settled that estoppel in pais must be pleaded, and, as the answer contains no allegation to the effect that the city compelled defendant to tear up its turntable, that question cannot be considered by this court. The records of the suits mentioned in the fourth proposition are not copied into the bill of exceptions, so that it is impossible to tell anything about the issues involved in them, or what possible effect they may have had upon defendant's failure to operate the road. The only litigation mentioned in the answer seems to have been by the city, and the evidence shows that it resulted in favor of defendant. But even the record in this suit is not in the bill of exceptions.

A further contention is that the record shows that the relator waived all the causes of forfeiture complained of. This contention is based upon Sec. 17 of the ordinance supra, which in case of forfeiture by defendant of its franchises for failure to comply with the provisions of said section, provides that such forfeiture may be had by proceedings instituted by said city in its own name in a court of record in Jackson county, Missouri, and that if any proceedings be not commenced within six months after such forfeiture has accrued, the city shall be deemed to waive the effect of such forfeiture. The streets of Kansas City are for the use of the general public, and its officers had no right to contract with defendant by ordinance or otherwise that non-user of its tracks by the corporation for the period of six months, or any other length of time, should not operate as a forfeiture of its franchises. To do so would be to recognize the authority of the city to grant the right of the use of its streets for private purposes, which it clearly has no right to do. To lay railroad tracks in the streets of the city, and then not use them, would not be a public use; and it is only in that sense that a city has a right to grant the use of its streets to any person or corporation for the purpose of operating cars thereon. To grant the use of its streets for a private use would be a misappropriation of the streets, and without authority on the part of the city. If the city had a right to provide by ordinance against the forfeiture of the franchises of defendant on account of the non-user of its tracks for a period of six months, it had the same right to provide against its forfeiture for an indefinite period, and thereby convert the use which was and could only be public to a private use. *State, St. Louis Underground Service Co. v. Murphy*, 134 Mo., 548, 34 L. R. A., 360. In the case of *Washington & R. Turnp. Road v. State*, 19 Md., 239, it was

said: "The consequences of the argument that an inability to keep the road in good order, owing to want of means, relieves the company from the duties imposed upon it by its charter, would be that the state would be obliged to permit the existence of roads impassible, and even dangerous. Such, it may safely be asserted, is without support from authority. In fact, the conclusion would seem to be inevitable, that is (as is conceded) the state can authorize the construction of a railroad anywhere within her jurisdiction, such authority is absolute, and can impose upon her no restriction, no loss of any other of her sovereign rights and powers, and cannot operate to close the doors of her own courts against her, when she wishes to inquire into the delinquencies of a corporation created by her, and responsible to her.

(Supreme Court of Missouri, *State of Mo. vs. East Fifth Street Railroad Company*, 38 Lawyers' Reports Annoted, 218.)

*Crossing of Trolley and Steam Railway Tracks—Injury by Trolley Wire to Person on Freight Train.*

The court concludes its opinion as follows:

There must be a duty by defendant in error to deceased before it can be said it was negligent in stringing its wire as it did. *Elliott v. Railroads*, Secs. 466, 472, and 1251; *Cooley on Torts*, 659-60. The latter author says: "The first requisite in establishing negligence, is to show the existence of a duty which it is supposed has not been performed."

The wire in question was strung rightfully, as it must be presumed in the absence of proof to the contrary, at the place of the accident. It was at a sufficient height to permit ordinary freight cars to pass under it with the brakeman standing on them, and so as to leave a space of four feet or more between it and the top of a barrel car. Deceased was five feet nine or ten inches in height, and the wire struck him on the breast. Defendant in error provided a safe passage for the barrel car with two men sitting upon it. That is all it should have done. The law does not require that it should anticipate every possible circumstance, or state of facts liable to occur, which would make it dangerous to string its wire at the height it did, only that it should be so placed that it was reasonably safe for the passage of persons who had the right to pass under it, not for persons who, for their own convenience or pleasure saw fit to pass under it by other than the usual and ordinary methods of travel or business. There were forty-nine other cars in the particular train on which deceased might safely have stood and passed the wire, or sitting on the barrel car he could safely have passed it.

In *Ry. Co. v. Walter*, 147 Ill., 64, in regard to the brakeman sitting on a high car of a train which passed under a bridge, causing his death while in the discharge of his duty, the Supreme Court approved an instruction to the effect that the law did not require the railroad company to build its bridges of such height that its brakemen can stand on the cars and pass under them in safety, and said that the only question was whether the bridge was of sufficient height that brakemen could discharge their duties with reasonable safety.

Certainly it is plain this wire was high enough to allow deceased to pass safely under it had he been sitting. This



was all the duty it could be said defendant in error owed to the deceased, if, in fact, it owed him any duty at all. He stood upon the barrel car for his convenience or pleasure—not because of the call of duty, or in the exercise of his right to be there, and no obligation rested on defendant in error to protect him from injury on the high car.

(Appellate Court of Illinois, *Gross v. South Chicago Railway Co.*, 30 Chicago Legal News, 186.)

*Responsibility of Master for Act of Servant Contrary to Orders—Horse Frightened by Street Sprinkler Operated by Electricity—Duty of Those in Charge of Cars.*

If a servant is acting in the execution of the orders of his master, and by his negligence causes injury to a third party, the master will be responsible, although the act of the servant was not necessary for the proper performance of his duty to his master, or was even contrary to the orders of his master.

Anyone who undertakes to propel a street railway car in a condition in which a reasonably prudent man would apprehend that it would frighten horses is bound to employ reasonable means to prevent injury to persons riding or driving along the street.

Where black coats were hanging on a projection at the side of a street water sprinkler operated by electricity, by, along, and on the tracks of an electric street railway, and the coats, by waving to and fro in the wind, or by operation of the car sprinkler along the tracks, frightened a well-broken horse of gentle disposition, and caused injury to the plaintiff, who was thrown from his carriage, the question whether the employes of the defendant, the street railway company, were in the exercise of reasonable care to prevent injury in operating such street car sprinkler, and the consequent liability of the company for the injuries to the plaintiff, is a question which the trial court must submit to the jury for their determination, even though it be that the coats belonged to such employes, and were by them hung upon the projection of the car, the car being in such a condition as to cause fright to the horse, and consequent injury to the plaintiff became a question for the jury to determine whether the defendant company was negligent in the performance of its duty to exercise reasonable care, by its servants, in the use of the public street, by operating the car while in this condition.

Quaere: Can the operation of a street railway car, painted a conspicuously bright and attractive color, along a public street, causing fright to a horse, with injury resulting therefrom, constitute negligence on the part of the street railway company, and render it answerable for injuries resulting from such cause?

(New Jersey Court of Errors and Appeals, *McCam v. Consolidated Traction Co.*, 38 Lawyers' Reports Annotated, 236.)

For more than a year there has been a bitter fight between the New York & Philadelphia Traction Company and the Brunswick Traction Company over franchises and rights of way in Bound Brook and other New Jersey towns. After a conference between the officials of the roads it was decided to withdraw their suits from the courts and make an amicable settlement. It was further agreed that the companies may each use the other's lines, and that the next extension will be from Bound Brook to Dumellen.

CLEVELAND, MEDINA & SOUTHERN.

The Cleveland, Medina & Southern Electric Railway Company, which was incorporated in October, 1897, to build an interurban line from Cleveland to Cincinnati, has already done considerable work and expects soon to let contracts for the power house equipment, and the rolling stock, and also for more grading and line work. Contracts for the grading and overhead work as far as Wooster, 52 miles, have been let, the ties purchased, and the company advises us that it expects to have this road as far as Chippewa Lake, 32 miles, in operation by June 15. When this is completed the construction on the section from Wooster to Columbus, via Mt. Vernon, will be commenced.

Cleveland is already the center from which five electric interurbans radiate, and the one under construction makes the sixth. This last road does not, like some of the other electric lines, parallel any railroads, the projected route as far as Columbus being at all points from 2½ to 15 miles from either steam or electric roads.

Between Cleveland and Wooster the road passes through the towns of Linndale, Albion, Strongsville, Brunswick, Me-



dina, Chippewa Lake, Leroy, Creston and Madisonburg. As seen from the map the road will be a much shorter route to Cleveland from these towns than any now available. Thus from Creston it will be 42 miles, while the western business of the Erie Railroad in order to reach Cleveland must be carried as far east as Leavittsburg, making a haul of 112 miles. The Pittsburg, Ft. Wayne & Chicago Railroad, which touches this line at Wooster, now transfers its through cars for Cleveland to the Cleveland & Pittsburg at Alliance, O., making the distance, 97 miles, as against 52. Similarly the Baltimore & Ohio reaches Wooster and runs north to Lodi, thence east to Akron, where a transfer is made, making 96 miles to Cleveland.

Chippewa Lake is one of the most popular points for pleasure excursions in northern Ohio, and the company intends to provide every facility for handling the excursion traffic.

The rails to be used weigh 65 lbs. and are laid on oak ties spaced 2 ft. between centers. In the line work 30-ft. cedar poles with 7-in. tops are used.

The company is capitalized for \$750,000, and the officers are: President, F. C. Goodman; vice-president, F. C. McMillan; secretary, A. R. Gibson; treasurer, J. W. Roof.

### A HOT TIME ON THE WIRES.

The illustration, which we reproduce from the Journal of Electricity, shows the remains of the two gray eagles that last fall caused a short interruption in the service of the 10,000-volt transmission line of the San Joaquin Electric Company, of Fresno, Cal. The two eagles evidently alighted on different legs of the three phase circuit, and coming in contact, formed a short circuit which not only incinerated the



WHAT THE LINEMEN FOUND,

eagles, but also burned off the wires. Where the broken wire touched the ground the soil, which is granitic sand, was fused into glass, and in one place a piece of quartz was found fused and run in with the glass. This piece is shown in the illustration.

### A FEW LESSONS FROM STEAM ROADS.

Street railways are daily finding it to their advantage to copy many of the systematic methods in use on steam roads. In view of the consideration that is now being given by many managers to the matter of keeping a continuous record of the power consumption of each motorman for the purpose of stopping waste of power, it will not be out of place to investigate the methods used on steam roads for carrying out the corresponding idea of keeping a record of the coal consumption of each engineer.

When coal records were first proposed there was naturally some fear among steam road men lest the clerical labor required would counterbalance any saving that might be made. There were also those who maintained that even if such coal records were kept, the various engineers would be indifferent to their individual records and no benefit would result. The fallacy of all these objections is best shown by the fact that today practically every steam railroad of any size has adopted the plan of keeping comparative coal records for each engine crew, which fact makes it unnecessary to add that the scheme is a money saver. Experience proves that the engineers will strive for a good record and that a great waste has been stopped by the keeping of such records.

It will not be necessary to go into the details of how the coal records are kept, as street railway managers will be interested simply in methods of instruction and discipline in use.

On the Chicago Great Western Railway, which has a very complete system, the engineers are compared on the basis of coal per ton-mile. Engineers that are in the same class of service on the same division only, are compared. It is determined by careful trials what is the lowest coal consumption per ton-mile that can be expected under favorable conditions. At the end of each month records are posted for each class of engineers showing how each one's performance compares with the standard figure. If any man's record is better than standard it is considered a high distinction, and the men take great interest in the records. On another large road an average has been established for each month of the year with which the engineers' records are compared. Usually each engineer receives a letter every month. If his record is good he is commended for it. If poor his attention is called to the fact and he is asked if he cannot improve it. If his record continues very bad an instructor makes a few runs with him to try and suggest how he can improve his methods. After some time it is found that all the different men's records are very close together. If a man complains that his low record is the fault of his engine, he is the next month given an engine run by a man making a good record. It has been found that even the most economical men improve very much, while in the case of those making the poorest records at first the improvement is enormous. Occasionally an engineer is found who has such deep-rooted wasteful habits that he is dismissed. On some roads a man's standing and promotion depend largely on his coal consumption record, taken together with his other qualifications. In view of the facts demonstrated by experience it is idle to maintain that properly kept comparative records have no effect on the behavior of the majority of men. That there are a few indifferent is to be expected, but they are not the kind that a railroad wishes to keep.

Fair comparisons of performance and credit for good work are the surest means to success in handling railway employes and insuring economy in all departments.

### A LIABILITY COMPANY SUED.

An interesting suit has been commenced by the City Electric Railway Company, of Port Huron, Mich., against the Guarantors' Liability Indemnity Company. A passenger was injured in the collision of an electric car with a locomotive and a judgment of \$1,000 was rendered. The railway company, which had paid an annual premium of \$1,500, sent in a bill to the indemnity company but payment was refused. As a consequence a suit in the circuit court was commenced.

It is reported that the Brooklyn Rapid Transit Company contemplates building a subway under Park Row, Center street and City Hall Park, from the Brooklyn bridge to Broadway and Warren street. The construction presents no engineering difficulties, and would greatly facilitate the handling of the bridge traffic.

Since commencing the work of changing its cable lines for underground electric working, the Capital Traction Company, of Washington, D. C., has decided to change the 7th street line also, which includes about three miles of double track.



### ELECTRIC CARS FOR HAULING ORE.

Shortly after the opening of the freight line of the Butte (Mont.) Consolidated Railway Company, in the fall of 1896, we illustrated the motor cars, of which there were two in operation at that time, employed in hauling ore from the mine to the smelter, a distance of three miles. Since then the operation of the ore road has been continued with constant additions to the equipment, as the service was found efficient and economical. Our illustration, for which we are indebted to the general manager of the company, J. R. Wharton, shows a train of eight of these on Montana street in Butte. The train is at the bottom of an 11 per cent grade, the front cars being on the commencement of a 9 per cent grade. Each car is loaded with 11 tons of ore. On February 1 these cars hauled 164,484 tons of ore.

The bodies of these cars were built by the Ramapo Iron Company and the trucks by the Peckham Truck Company.

The names of the exhibitors assure the success of the undertaking. It appears from them that there will be a good demonstration of electric power uses. Gas and oil engines as prime movers will compete with the steam engine for the smaller installations.

In electric railway work, some most interesting exhibits will be displayed, including several ingenious methods of perfecting the underground trolley and third rail system. There will be an operative exhibit consisting of a section of the under-running electric road with yokes, tracks, etc., blocked up above the floor of the Exhibition Hall, showing the method of picking up the current in this system. This will be a complete reproduction of a section of the system as in use on Madison avenue, New York, with one of the new cars in actual operation, and will be shown in addition to their general display by the John Stephenson Company, Peckham Motor Truck & Wheel Company, Walker Company, Gold Car Heating Company, Sterling Supply & Man-



TRAIN OF ORE CARS, MONTANA STREET, BUTTE.

### THE ELECTRICAL EXHIBITION.

In previous issues we have noted the plans of the Electrical Exhibition Company, which is conducting the "Second Electrical and Kindred Industries Exhibition," which will be held at Madison Square Garden, New York, next May. Those having the matter in hand have displayed great energy and the result of their efforts is to be seen in the wide-spread interest taken in the exhibit by manufacturers in the electrical and kindred fields. The management has published the preliminary list of exhibitors, which includes over 100 of the leading firms and companies in these lines, with allotments of space aggregating nearly 30,000 sq. ft. This is particularly gratifying since at the corresponding period before the first exhibit, in 1896, less than one-fifth as many exhibitors had signified their intention of taking space. It certainly behooves those others who desire to secure any of the space which yet remains to make their applications at an early date.

ufacturing Company, Providence Fender Company, and other companies who furnish supplies and material in connection with this class of work.

To convince export merchants of their opportunities in the electrical line, will be one of the benefits of this exhibition, and not its smallest. The markets north and south of this country are not yet as fully ours as they should be by any means; and while we are selling such apparatus in such large quantities to England, France and Germany, those countries are still getting orders that should be ours, all the way from Florida to Patagonia, to say nothing of the far east. Consumers visiting this country to give contracts for apparatus dislike greatly having to travel long distances to see some of it, and at this show they will find in profusion the objects they seek and want to buy.

The educational features of the exhibition were placed in charge of an auxiliary committee consisting of able men. Its plans are being carefully developed with a view to informing and interesting the public; the announcements of this committee are expected at an early date.

### T. J. NICHOLL'S WORK AT ROCHESTER.

The annual report of the Rochester Railway Company shows a remarkable improvement in the condition of the road as compared with previous years, especially in view of the adverse conditions which have been encountered, and the improvements which have been made in the system.

The result of the year's labor shows a surplus of \$5,623, against a deficit of \$43,652 in 1896, and this with a decrease of \$56,258 in the receipts, caused by unusual weather conditions, the great number of bicycles, and on account of many of the main thoroughfares having been torn up for repairs. The operating expenses for the year were \$491,420, against \$591,650 in 1896, a saving of \$100,230, or over 17 per cent. The percentage of receipts required for operation was reduced from 69.82 to 62.11 per cent, notwithstanding the large decrease in receipts. Had the earnings of the road been as good as in the previous year, there would have been a surplus of \$61,881, or an improvement of \$105,534.

The above economies have not been effected to the detriment of any branch of the system; on the contrary there



T. J. NICHOLL.

have been more necessary improvements made than ever before, more miles of streets have been paved or repaved, and more track relaid. The equipment has been put in better condition, the power house has also been greatly improved, and the service in general is much better than at any previous time.

The above remarkable showing has been effected through the ability and untiring energy of the present vice-president and general manager, T. J. Nicholl, who took charge of the company's affairs about a year ago. Since that time its stock has more than doubled in value, and its steadily advancing as the improvements become more apparent each month. The outlook for the present year is very encouraging, for while expenses are being maintained at the same or

a lower figure than last year, the receipts are greater than for the corresponding period.

Mr. Nicholl was born in England, but came to America when quite young. He commenced his railroad career with the engineering department of several western railroads, and afterwards successively became chief engineer of the Gilman, Clinton & Springfield Railway (now the Springfield Division of the Illinois Central); superintendent of the Dakota Central Division of the Chicago & Northwestern Railway, operating 600 miles of road, which was built under his supervision; vice-president and general manager of East & West Railway of Alabama; president and general manager of the Natchez, Jackson & Columbus Railway; general superintendent of the Louisville, New Orleans & Texas Railway; general manager of the Chattanooga Company Limited, and president of the Chattanooga Terminal Railway Company; and at the last convention of the New York State Street Railway Association, Mr. Nicholl was elected vice-president.

### THE CARE OF BOILERS.

A recent number of "Engineering," London, contains a leader on the care of steam boilers, in which attention is drawn to the fact that too often the men in charge of a steam plant, either through ignorance or a belief that boilers are unworthy their consideration, pay no attention to the boilers. Two instances are cited from reports of the Board of Trade inquiries into boiler explosions in the following language: "The delightful simplicity of the engine tender who, in a certain Yorkshire town, advised his master on no account to have his boiler insured, because every time the insurance company inspected it they would be sure to want some alterations made, and who recommended in place of periodical inspection by a qualified man, that the boiler should be charged from time to time with pigeon-dung to prevent corrosion, is only surpassed by the culpability of a certain owner who worked a boiler for over 20 years without ever having it examined by a competent person. These are only two cases taken at random out of a host of others which all point to a lamentable lack of ordinary common sense with regard to the management of boilers."

The writer discusses the great enemies of steam boilers, corrosion and incrustation, and a few of their causes; among these are oil and grease in the boilers, electrolysis, the solvent action of pure water, the presence of oxygen and carbonic acid gas in the water. In connection with incrustation the "boiler compound man" and his remedies as well as others are thus mentioned:

"Some are good, some useless, some actually harmful, and nearly all expensive out of all proportion to the good they do. Many of these nostrums are indeed traps for the unwary and lucrative sources of income to those who sell them. The best remedies for corrosion are generally the simplest and least expensive; but after all there can be no hard-and-fast rule laid down as to what should and what should not be used, as so much depends on the water, the kind of boiler, the conditions of work, and many other things. Perhaps two of the simplest remedies ever used as a safeguard against incrustation are petroleum and common soda; but even these must be used with care, and in the proper proportions, else the evils that they cure may be less than those they bring about, and it all comes back to what we said before, that steam users should have some competent man to



advise them, be he the engineer to a boiler inspection company or any one else capable of giving sound advice on the subject."

This statement regarding the use of petroleum and soda made editorially by "Engineering" is in direct conflict with the recommendations of W.H. Edgar in his discussion of the effect of introducing volatile oils in boilers which will be found on another page. Mr. Edgar maintains, and gives excellent reasons for his position, that kerosene only injures the plant; his advice as to soda is, "but do not use any soda."

### ALUMINUM CONDUCTORS.

In a paper, by A. E. Hunt, president of the Pittsburg Reduction Works, on "Aluminum as a Rival of Copper and Brass for Electrical Conductors," some interesting figures and comparisons are given. It is evidently the intention of the manufacturers of the metal that it shall become a rival of copper, for a special rate of 29 cents per lb. has been made for aluminum in wire, rods, bars and plates to be used for electric conductors. Furthermore experiments are now being made to determine just what alloy will furnish the maximum tensile strength, together with the greatest electrical conductivity. From results obtained it may be predicted that an alloy of aluminum can be made with a tensile strength of 165,000 lbs. per sq. in., with an electric conductivity of more than 50 per cent of pure copper.

Copper is 3,332 times heavier than aluminum, and has a tensile strength of from 16,000 lbs. per sq. in. for pure soft annealed copper to 65,000 lbs. when in hard drawn bars compared with 26,000 lbs. for pure aluminum drawn into soft wire or 40,000 lbs. in hard drawn wire. The substitution of an aluminum for a copper conductor means an increase in the cross section of 60 per cent, but a decrease in weight to 48 per cent. This increase in size will entail an extra expense for insulation of about one-third, but this remains to be accurately determined from some installations to be made later.

For aerial lines it has been determined that the snow and ice load is practically as heavy on lengths of small wire as upon large sections, so that no objection can be urged on this score to the use of the larger sections of aluminum wire. On account of having only 48 per cent of the weight and 60 per cent more strength the aluminum conductors could be used in longer spans between supports, reducing the number of poles and insulators. Properly drawn aluminum wire is as tough and will stand as severe bending without breaking as soft copper wire. The toughness of aluminum wire is, however, greatly modified by the care and skill in manufacture.

The power of withstanding corrosion is greatly in favor of aluminum. Copper does not change in dry air, but in the presence of moisture it becomes covered with a layer of basic carbonate of copper which has a corroding action, and does not coat and protect the underlying copper. Ammonia in contact with copper absorbs oxygen and the copper dissolves in consequence of the formation of a soluble cupric oxide. Aluminum is not acted upon in dry air, and in moist air an oxide of aluminum is formed, which prevents corrosion beneath the surface. Ammonia solutions act upon aluminum only upon the surface, leaving a brown coating containing silicon which resists corrosion from dilute mineral and organic acids.

The difficulty of soldering or brazing aluminum is the

chief drawback to its use as an electrical conductor. It can be soldered but it is a more difficult and slower operation than with copper and the joints deteriorate more rapidly, due to the galvanic action between the aluminum and the metals of the solder. Several forms of metallic joints have been successfully used to avoid the necessity of soldering.

The Journal of the Association of Engineering Societies for January contains "Some Notes on Aluminum," a paper read before the Detroit Engineering Society by Jesse M. Smith. In discussing this paper H. G. Field made the following remarks:

"I have just returned from a meeting of the American Street Railway Association at Niagara Falls. While there, I learned from Mr. Candee, one of the leading manufacturers of insulated wires, that he has under advisement at the present time the possible use of aluminum to replace copper as an electrical conductor.

"There are numerous objections to be overcome, both as to structural considerations and as to the cost of insulating and handling. The electrical conductivity of aluminum, in equal lengths and the same weights, is approximately twice that of copper; but, for the same cross-section, the specific resistance of aluminum is nearly double that of copper. The additional diameter of aluminum over that of copper for the same conductivity, will increase the cost of insulation for the same conductivity. The larger diameter also means more surface for the leakage of current, and the insulation resistance will be less, unless the thickness of the insulation is increased. An increased thickness of insulation means increased electrostatic capacity as well as greater cost. Moreover, it is found that if aluminum wires, of ordinary size, such as are used for electrical conductors, are bent once through an angle of 90° and back, they will break, whereas ordinary commercial copper conductors will stand from 15 to 20 of these same bendings before breaking.

"These are all objectionable features, and it would therefore seem doubtful whether aluminum conductors will prove merchantable. If such conductors are to be made commercially valuable it seems that the method of protection must necessarily be reduced to that of a mechanical covering, such as a braid or a series of braids treated with a bituminous composition to make it weatherproof, and also to assist in mechanical strength. This, however, will limit the use of aluminum for electrical conductors to special applications and prevent it from coming into general competition with copper.

"As particularly applicable to aluminum in the conduction of electrical currents I observed, at the Niagara Falls Power Company's work, 500 conductors about 000 B. & S. gage, used for carrying the current from the bus bars in the dynamo room up through the penstock shaft into the factory above, a distance of something over 200 feet. These conductors were not insulated, except by a coating of paint over each one. Each set, of 250 each, is run in a separate wooden trough up through this shaft. This is the only insulation provided. These conductors are riveted to copper bus bars at the terminals. The dynamos connected to these bus bars have a normal capacity of 4,000 to 6,000 h. p.

"I would state also that the Westinghouse Electric & Manufacturing Company is now using fuses of aluminum for switchboard work. These fuses are long and made of thin metal with reduced sections at the center. These are found to be accurate in rating, mechanically serviceable, and in many respects superior to the common soft metal fuses."

## THE USE OF SALT.

The question of whether street railways shall be permitted to use salt is again before us. The Binghamton (N. Y.) Railroad Company has for some years made use of salt to remove snow and ice and without opposition, until this winter when a number of horse owners became impressed with the idea that the salt was injurious to the horses' hoofs, and insisted upon the chief of police enforcing an old and almost forgotten ordinance against the use of salt. The management of the company realized that the question would no doubt be raised elsewhere and decided to test the validity of the ordinance, so that other roads in the state might have the benefit when confronted with the problem of keeping their lines open without salt.

J. P. E. Clark, the general manager, waited upon the chief of police, and stated that he had no desire to embarrass him in the discharge of his duty, but that the company regarded the use of salt as necessary to the operation of its road. The police were notified when the track was to be salted and were on hand to interfere. The company was fined \$100 before the city recorder, and appealed the case to the county courts where the validity of the ordinance will be contested on the ground that the council has no power to pass an ordinance imposing a fine for performing a necessary duty, that is, that the ordinance is in conflict with the rights conferred by the franchise of the company. Since the state law prohibiting street railways from salting their tracks was repealed in 1885 this contention appears to be correct.

Bills have been introduced in both houses of the legislature expressly authorizing the street railway companies to use salt, and the matter may be thus settled without waiting for the interpretation of the law as it is.

In an open letter to a local paper Mr. Clark says in part:

From the standpoint of practical operation, I state unreservedly that in case of snow storm either slight or severe, without the right to use salt upon curves, switches or cross-overs, it would be, in the first instance, very difficult and, in the second instance, entirely impracticable to operate electric cars without causing a tie-up of the system more or less general, thereby inconveniencing the public, especially the working people who are dependent upon the street cars for reaching their respective labors. We are handling at the present time a daily average of 10,000 persons, who would be affected by such delay or tie-up, and who, I believe, are entitled to consideration in determining the question.

For instance, we are transporting every morning between the hours of six and seven nearly 400 employes of the Lestershire Manufacturing Company, who reside in Binghamton. It goes without saying that they expect regular service (which we endeavor to afford them) regardless of the weather, and if regular service is not forthcoming they would have to make other arrangements. I consider the accommodation of the public the paramount question, although the financial loss of thousands of dollars in a particularly trying season of the year is a matter of considerable moment to ourselves at least. We consider ourselves an important local business and wage paying institution and believe we are entitled to some consideration in the matter.

The introduction of electrical traction and its rapid development of the past few years, has found municipalities, and even the state, unprepared with laws and ordinances necessary to regulate the every day operation, therefore, emergencies as they arise have to be met with good judgment until laws can be modified or new laws enacted whereby successful electric street railway operation can be carried on. In the days of horse cars in this city, with only one division to operate, it made no material difference whether or not there was an inch or two of snow and ice on the rail; but with the operation of electric cars the surface of the rail must be exposed before proper traction

and a complete circuit can be effected and the numerous switches and curves with their spring appliances, necessary to properly radiate the respective divisions of the system, must be kept entirely free from snow and ice and the only means whereby this can be accomplished is by the use of salt thereon. Therefore I consider the use of salt for the removal of snow and ice a very important question, confronting both municipalities and street railroads throughout the state where local ordinances do not exist granting the necessary right to use same in reasonable quantities.

Court street, the principal business thoroughfare of the city, seems to be the local bone of contention. The curves, intersections and cross-overs are numerous between Exchange and Oak streets and the salt is distributed thereon and the snow gathered up by the street department from the cross walks and thrown into the street is carried by the various vehicles between the points mentioned above, thereby injuring the sleighing and depriving this business thoroughfare to a certain extent of its utility as a boulevard. However, it seems to me as a citizen, irrespective of my business relations, that a rapid developing city the size of Binghamton, can well afford to give up a small portion of its principal business streets to business pursuits and confine the pleasure riding to the miles of thoroughfare where street railroad tracks and other evils (some of which, however, are quite necessary to the development of a city) do not exist.

It seems to be resolving itself into a question of whether adequate street railroad service shall be provided the thousands solely dependent thereon, or whether the principal business streets shall be preserved for the benefit of the horsemen. However, we do not wish to appear arbitrary or oppose existing laws and think this a question which with mature consideration and deliberation will right itself. In the meantime we shall strive to do the very best we can under the existing circumstances and afford the public as little inconvenience and delay as possible.

The reasons that have been urged why the use of salt should not be permitted are that it causes deterioration of the pavement, that it induces a lower temperature and injuriously affects the public health, that it injures the hoofs of horses and that the salt water is thrown on carriages and other vehicles and is more or less destructive to the varnish. In Washington, also, the Metropolitan Railroad has made complaint that the salt water has caused great damage by getting into the underground conduit and destroying the insulation, 54 cars having been disabled in three days from this cause during the winter of 1896-7. This objection is of course confined to Washington and New York city.

Of the other objections mentioned only the first has the merit of novelty. In the winter of 1894-5 a controversy over the use of salt arose between the street railway company and the city authorities of Newport, Ky., the latter claiming that the salt injured the brick paving. The injurious effect is, of course, not due to the salt itself but to hydrochloric acid which may be liberated by the reactions between the salt in solution and the various substances with which it may come in contact in the street. The extent to which such reactions take place must in general be rather limited. The authorities on brick agree in saying that while hydrochloric acid may cause rapid disintegration of soft brick it can have no effect on hard-burned or vitrified brick, such as are used for paving.

In Washington, where there is a great deal of asphalt paving, the use of salt has been prohibited for years past; it was always applied to the tracks when necessary, however, and the objection, so far as we know, was never made that there was serious injury to the pavement. In any event it would appear that since in the majority of cases the railway company has to keep the portion of the street occupied by it in repair, the company alone has ground to complain that the salt injures the paving.



The subject of the effect of salt on the public health and on horses' hoofs and on carriages was the subject of a report by a committee of the American Association in 1884. A great many medical opinions were taken and all agreed that the use of salt could have none but a beneficial effect on the public health. The discussion brought out the fact that on one of the largest street railways in the country, the horses were frequently kept with their feet in a bath of salt water for from three to six hours per day, the object being to remove soreness and cause the hoofs to grow. The beneficial results to be obtained from such treatment were corroborated by others who took part in the discussion.

The only valid objection which remained was the effect of brine on coach varnish. This is certainly not a serious one, for the carriages that would be injured are under no necessity of following the car tracks, where, only, the salt water is to be found.

The conclusions reached by this committee were that the use of salt was an imperative necessity in winter, and that any objections to it could easily be obviated. The evidence collected by the committee was published in a special report issued December, 1884, and was of great value to street railway companies in securing the repeal of obnoxious local legislation on the salt question. In New York the Penal Code, which made the use of salt by street railway companies a misdemeanor, was amended for the purpose of permitting its use.

At the present time it is more important that the rails be kept clean than it was in the days, nearly 15 years ago, when the use of salt was discussed by the American Association. It is necessary that the wheels of the car make contact with the rails for electric traction, and on curves and at special work where the resistance to traction is increased this is particularly important.

At the Montreal convention of the American Association a committee consisting of D. G. Hamilton, president, and Robert McCulloch, general manager, of the National Railway Company, St. Louis, presented a report upon the necessity of using salt and sand on street railway tracks, and regarding salt the report said: "The use of salt on the rails at certain times and during certain conditions of weather is absolutely necessary in order to clear the rails of a film of ice that will otherwise form on them. Without the use of salt it would be very unsafe to operate cars on a hilly system during winter and the committee is of the opinion that no road can afford to dispense with its use. Salt has been used on street railways throughout the United States constantly while horse cars were in vogue, and now more than ever before is its use imperative in the operation of electric cars."

**INJUNCTION AGAINST CHICAGO CITY DISSOLVED.**

Last summer the General Electric Railway Company secured an injunction to prevent the Chicago City Railway Company from interfering with the former company in completing its road, and from prosecuting any suit against it. The appellate court has just reversed the lower court; the opinion in part says: "The bill fails to allege any facts from which it can be told how any of the alleged acts or doings of the defendant or its agents and attorneys have injured, embarrassed, or delayed the complainant in the con-

struction of its lines of railway, nor in what way they have depreciated, or, to use the language of the bill, 'greatly tended to depreciate the value of the rights, privileges, and advantages secured to complainant,' nor in what manner complainant's credit has been or will be injured by any of said alleged acts or doings of the defendant."

**A PROSPEROUS RELIEF ASSOCIATION.**

The annual report of the Third Avenue Railroad Employes' Relief Association, of New York, was made February 25. The following officers were unanimously re-elected: President, John H. Robertson; vice-president, Isaac Hough; treasurer, John Beaver; secretary, Chas. C. Swertfager, and sergeant-at-arms, Sammel A. Jessup.

The treasurer's report for the fiscal year ending February 25 was as follows:

RECEIPTS.	
Cash on hand March 1, 1897.....	\$4,587.17
Dues, 65th street division.....	2,869.00
Dues, Harlem Division .....	2,704.00
Dues, 125th street & 10th avenue division... ..	1,379.00
Membership fees .....	583.00
	7,535.00
Assessments, 65th street division.....	38.50
Assessments, Harlem division.....	82.25
Assessments, 125th street division.....	20.00
	140.75
Received from two entertainments.....	2,091.75
Received from picnic.....	1,621.50
	3,713.25
Total .....	\$15,976.17
DISBURSEMENTS.	
Sick benefits .....	\$3,767.00
Death benefits .....	2,450.00
Talent, music, decorating hall, badges, printing, etc., for picnic, etc., entertainments .. ..	475.69
Dr. W. E. Woodend, salary as doctor.....	900.00
C. C. Swertfager, salary as secretary.....	461.00
General expenses .. ..	453.81
Stationery, printing, etc.....	115.25
Prizes for picnic.....	85.35
Rent of hall.....	50.00
	8,758.10
Cash on hand March 1, 1898.....	\$ 7,218.07

**CAR LINES CAN NOT BE BLOCKED IN ST. LOUIS.**

A sewer was laid out in St. Louis across one of the lines of the Union Depot Railroad Company. One night recently, after an owl car had passed, the contractor moved his excavating machine directly across the line blocking both tracks. Harry Scullin, general manager of the company, notified the street department of the city, which resulted in the contractor and several of his men being arrested. The machine was moved into a vacant lot and a temporary injunction was obtained restraining the contractor from interfering with the operation of the street cars. He was also cited to show why he should at any time block the car lines. When the right of the street railway company had been upheld an agreement was made with the contractor allowing him eight days to do the work, the passengers being transferred across the break. In this way the differences ended amicably.

## FREIGHT AND PASSENGER RATES ON INTERURBAN LINES.

In the development of the street railway business, as in nearly every other industry, certain principles become well defined by experience, but these are subject to change with new conditions. The street railway is an institution essentially for transporting passengers short distances, but of late years a new function has been added to it. After electricity placed the cities in close communion with the outlying districts and even contiguous towns, some far-sighted street railway managers saw a new and fruitful source of income in the carrying of packages, parcels and light freight on the cars. With frequent trips, cheap operation and low rates it seemed that a good business could be secured in competition with steam lines. Even in the cities the substitution of the electric car for the noisy drays and wagons might be effected with advantage to everyone. An inducement was offered by the Government for them to diverge from a strictly passenger service and carry the mail.

These possibilities were enlarged upon to such an extent that some interurban lines were planned with the freight and parcel business considered a large factor. The failure of the outcome of these hopes brought some of the interurbans into the hands of receivers and disappointment to many others. In the cities any concessions, for facilities in shipping or handling cars carrying freight, were vigorously opposed. In competition with steam lines, many difficulties were encountered. Connections with the steam roads were hard to make for competing lines were usually parts of, or feeders to large systems. In the cities it was found that the parcel service did not pay for the trouble and could not successfully compete with the more convenient wagon delivery at the door. Almost the same might be said of package and light freight between neighboring towns where the express companies were in the position to serve their patrons in a more convenient manner. Even the mail service fell below expectations and proved a loss in nearly all cases where separate cars were provided.

Through these ventures experience was gained and the freight service remained only under the fittest conditions. That first period of disappointment is past, although some of the effects still remain. Street railway managers can now base their calculations upon some data. This they are doing and instead of receding they are taking up the work in a judicious manner with prospects of success. The interurbans are stretching out and every town and city tapped increases many fold the possibilities of a successful freight business. In many places the express companies now recognize the advantage of the trolley car over the wagon and steam baggage car, and have made contracts with the railway companies. The Government is more liberal in its appropriations for the mail service and here the receipts are nearly all profit when the mail is in pouches carried in the vestibule of the car. Most of the franchises now sought contain some freight clause. In the near future it seems that as one town is joined with another by interurbans there will be a consolidation of interests and systems of considerable magnitude will be formed.

As a rule the people and public officials begin to recognize the value of the trolley freight service. In New Jersey such traffic is forbidden by law; in California the courts have laid arduous restrictions upon it, and in Massachusetts and some other states a special legislative act is necessary for trans-

porting freight. The opposition emanates generally from the railroads for under some conditions they fear freight rates will be lowered as have the passenger rates, always to the advantage of the electric lines. Many inquiries have reached us of late regarding rates and particularly in reference to the freight business. Although the REVIEW has investigated this subject before, progress has been so rapid it was thought well worth the while to get the expression of the latest views from street railway managers, and the following is the result:

The Los Angeles & Pasadena Electric Railway Company owns 44 miles of track between the two cities. Packages and freight are carried, there being one express car exclusively devoted to such service. The company furnishes the car and crew, but the business is controlled by the Pasadena Electric Express & Storage Company. For small packages 10 cents is the charge for each and the express and freight are handled in any quantities for 6 cents per 100 lbs. The passenger rates are as follows: 15 cents for a single trip; 25 cents round trip; 10 rides for \$1; 60-ride commutation book, good until used, \$6; same good for one month, \$5; 40-ride school ticket in Pasadena, \$3; same from Pasadena to Los Angeles, \$3.

The Elgin City, Carpentersville & Aurora Railway connects these three Illinois cities. The only freight business conducted is that of hauling freight cars from the Coleman station of the Illinois Central Railroad to the Illinois Southern Hospital for Insane, with switch tracks in Elgin and South Elgin. This work is done by an electric locomotive. There are four stations between Elgin and Geneva and two between Elgin and Carpentersville and the rates are 10 cents to Carpentersville and 25 cents to Geneva one way.

The Waterloo (Ia.) & Cedar Falls Rapid Transit Company has over nine miles of track with five stations. The regular passenger fare is 15 cents with commutation rate of 120 5-cent fares for \$5. The express charges are 20 cents for packages up to 100 lbs. and 6 cents for each 100 lbs. excess. The Milwaukee, Racine & Kenosha Electric Railway Company has 35 miles of track with 14 stations. The fare for the entire trip is 60 cents or \$1 for a round trip. The commutation tickets are sold for 20 per cent off regular rate. On the combination cars packages are carried for 10 to 25 cents with a weight limit of 200 lbs. The Manistee (Mich.), Filer City & East Lake Railway Company carries packages on its passenger cars; for an ordinary package, 5 cents; a trunk, 25 cents; beer keg, 10 cents, and other packages up to 100 lbs. are rated according to the size. In Brooklyn the National Express Company has an arrangement with the Brooklyn Heights Railroad Company whereby it runs its cars over the lines controlled by the railway company. The Nassau Electric Railroad Company, through the Brooklyn Heights, also grants to the express company the privilege of operating cars over certain of its lines, the compensation being on a mileage basis.

The Hamilton, Grimsby & Beamsville Electric Railway Company, with headquarters in Hamilton, Ont., owns over 23 miles of track and does a large freight business. The local freight and parcel express rates are based upon the mileage classified as the Canadian classification, the tariff being for six classes only. Class 1 includes tea; class 2, popcorn; class 3, canned goods; class 4, sugar in barrels; class 5, sugar in car loads, and all other goods are classed lower. The rates are given in cents per 100 lbs., being about 25 per cent lower than on the steam roads:



Hamilton, Grimsby and Beamsville Electric Railway.														
LOCAL PASSENGER TARIFF.														
SINGLE FARES.		Hamilton	Reservoir	Bartonville	Red Hill	Stoney Ck.	Fruitland	Smith's	Winona	Cline's	Park	Thirty	Beamsville	RETURN FARES
Miles		0	10	15	20	25	30	35	40	45	50	55	60	70
HAMILTON	0	0	10	15	20	25	30	35	40	45	50	55	60	70
RESERVOIR	3	5	0	10	15	20	25	30	35	40	45	50	55	65
BARTONVILLE	4	10	5	0	10	15	20	25	30	35	40	45	50	60
RED HILL	5	10	5	5	0	10	15	20	25	30	35	40	45	55
STONEY CREEK	7	15	8	5	5	0	10	15	20	25	30	35	40	50
FRUITLAND	10	18	10	10	10	5	0	10	15	20	25	30	35	45
SMITHS	11	20	15	12	12	6	5	0	10	15	20	25	30	40
WINONA	12	25	20	15	15	10	5	5	0	10	15	20	25	35
CLINE'S	14	25	20	20	15	15	10	8	5	0	10	15	20	30
GRIMSBY	18	30	25	25	20	20	18	15	10	5	0	10	20	30
PARK	20	35	30	30	25	25	20	15	10	5	0	10	10	20
THIRTY	21	40	35	35	30	30	25	25	20	15	10	5	0	10
BEAMSVILLE	23	40	35	35	30	30	25	25	20	15	10	5	5	0

A. J. NELLES,  
Manager

Hamilton, April 1st, 1897

Distance.	Class						Small
	1	2	3	4	5	6	
10 miles and under	10	8	6	5	5	5	25 cents.
15 miles and under	12	10	8	6	5	5	25 cents.
20 miles and under	14	12	10	8	6	5	25 cents.
25 miles and under	16	14	12	10	8	6	35 cents.

The charges for through freight are arranged on a percentage division with the steam railroads and the steamboat company. The through express business is handled by the Dominion Express Company which pays the railway company so much per 100 lbs. carried. Milk is transported in cans and charged for according to the distance. Mail is also carried by contract with the government. Over 171,000 packages of fruit were shipped last year, the railroad freight and express cars being run over the lines and loaded at the orchards and vineyards. The fruit is shipped to the market without any further handling.

For local single fares none exceed 2 cents per mile and for return fares the rates have been arranged so as to require little change. The company sells three mileage books: 1,000 miles for \$10, and a 400-mile book for \$5, these two books being good for any member of a family living in one house, and a 500-mile book for \$5, good only for one person. The line is marked off in miles and one coupon is taken for every mile and fraction of a mile traveled, but at least five coupons are taken for each ride. There are also commutation tickets for school children, workingmen, berry pickers in season, etc.

The monthly school tickets are good for 44 rides with the following rates:

Under 5 miles	\$1.25 per month.
Under 8 miles	\$1.50 per month.
Under 10 miles	\$1.75 per month.
Under 15 miles	\$2.00 per month.
Under 20 miles	\$2.50 per month.
Under 25 miles	\$2.75 per month.

The workingmen's monthly tickets are good for 52 rides and are sold as follows:

Under 3 miles	3 cents per trip.
Under 5 miles	4 cents per trip.
Under 7 miles	5 cents per trip.
Under 8 miles	6 cents per trip.
Under 9 miles	7 cents per trip.
Under 11 miles	8 cents per trip.
Under 14 miles	9 cents per trip.
Under 15 miles	10 cents per trip.

The Twin City Construction Company leases and operates 6¼ miles of track of the Winston-Salem Railway & Electric Company. Commutation tickets are sold 6 for 25 cents in strips and 24 for a \$1.00 in books. For the freight service there are one motor and three trail cars. The rates depend on the length of the haul, weight and nature of the material, the average price for coal being 50 cents per ton to termini, cotton 20 cents per 1,000 lbs. One freight load constitutes 12,000 lbs. The form of report for freight hauling is as follows:

TWIN CITY CONSTRUCTION CO., LESSEE.

Winston-Salem . . . . . 189 . . . . .  
 Motor Car No. . . . . Trail Car No. . . . .  
 Total Weight of Lot . . . . . Trail Car No. . . . .  
 Kind of Freight . . . . .  
 From . . . . .  
 To . . . . .  
 For . . . . .  
 Rec'd. . . . . Railroad Co., Car No. . . . .  
 Rec'd. . . . . loads as dated below:

Load, . . . . . 189 . . . . .	Hours, . . . . .	Hands, . . . . .
Load, . . . . . 189 . . . . .	Hours, . . . . .	Hands, . . . . .
Load, . . . . . 189 . . . . .	Hours, . . . . .	Hands, . . . . .

Total, - - - - -

Remarks: . . . . .  
 Hauling and delivery completed. . . . .  
 Signed, . . . . . Freight Conductor,  
 Approved, by . . . . .  
 For . . . . .  
 Entered by . . . . .

The Cleveland, Berea, Elyria & Oberlin Railway Company has a contract with the American Express Company and the only parcel or freight business is through that agency. There are 16 stations on the line which is 37 miles long. The rates are: Cleveland to Berea, 25 cents, round trip, 45 cents; Cleveland to Elyria, 45 cents, round trip, 85 cents; Cleveland to Oberlin, 60 cents, round trip, \$1.10. Commutation tickets are sold for individuals at a rate of 3 cents a station of 2½ miles, family tickets, 4 cents a station, and school tickets at half rate.

The Washington, Alexandria & Mt. Vernon Railway Company has one combination and three freight cars. Parcels are carried for 5 cents when weighing less than 10 lbs. 10 cents when less than 25 lbs., and 15 cents for 50 lbs. which is the limit. There are 30 stopping places on the route which is sixteen miles long. The passenger fares are from 5 to 35 cents one way and lower rates are given in the 25-trip commutation tickets for individuals, family and school children.

The Olean (N. Y.) Street Railway Company has recently posted this notice in reference to carrying packages on its cars:

"Articles when in charge of a passenger, who must pay regular fare for himself, will be charged for as follows: Bicycles 10 cents, trunks 25 cents, barrels under 100 lbs. 10 cents, barrels from 100 to 200 lbs. 20 cents, small kegs of beer 10 cents, large kegs of beer 15 cents, peddlers' packs 10 cents, wash baskets 5 cents. Articles not above enumerated, from 20 to 25 lbs. 10 cents, from 50 to 100 lbs. 15 cents. Articles occupying unusual space will be charged double rates."

The Akron & Cuyahoga Falls Rapid Transit Company has 23 miles of track with four stations with fares of 5, 10, 15 and 20 cents, no reduction being made for round trip

and no commutation tickets. Express packages are carried from Akron to Barberton and Cuyahoga Falls for 10 cents and to Kent for 20 cents. The route of the Kingston (Ont.), Portsmouth & Catawqui Electric Railway Company is 8 miles long. The regular fare is 5 cents but books of 100 tickets are sold for \$3.00. One freight car is provided and its use is charged for at so much per load. The Pittsburg (Kan.), Frontenac & Suburban Electric Railway Company operates 15½ miles of track and has three passenger stations. The fare is 5 cents between each station and 50-ride commutation tickets are sold for \$2.50 with privilege of transfer on city lines. Express packages are charged at the rate of 5 cents per 10 lbs. with a limit of 100 lbs.

Fig. 1 shows a shipping notice of the Mahoning Valley Railway Company which connects Youngstown, Girard and Niles, O. When the line was first opened the freight and package business was accommodated on the platforms of the passenger cars but this interfered with the passenger traffic. A contract was made in the early part of last summer with the American Express Company. Arrangements were further made with the Trumbull Electric Railroad Company to operate the freight and package car between Niles and Warren. Sliding doors were placed in the sides of an old 16-ft. box car and this was used for several months for carrying packages, freight and express matter. The business increased to such an extent that it was found necessary to have a larger car built adapted to the work. Fig. 2 is from a photograph of the new car. Three trips are made each way per day and the amount of traffic is deemed satisfactory by the company.



FIG. 2.—FREIGHT AND EXPRESS CAR.

The Akron, Bedford & Cleveland Railroad Company has a contract with the American Express Company and provides five combination cars for the traffic. The road is 26 miles in length and the fare varies from 5 to 60 cents, the latter being the charge for a ride from Akron to Cleveland.

The Toledo (O.) & Maumee Valley Railway, 22 miles in length, and the Toledo, Bowling Green & Fremont Railway, 13 miles long, are under the same management. The companies have four combination cars but can not do a freight or express business on account of the contract with the city company although a good business could be secured if arrangements could be made. Fig. 3 represents a ticket of the Toledo & Maumee Valley Railway Company with stations and rates of fare given, and Fig. 4 shows the


**MAKE YOUR SHIPMENTS**


BY THE

**ELECTRIC FREIGHT AND PACKAGE LINE**

CONNECTING  
**Youngstown, Girard, Niles, and Warren,**

OPERATED BY  
**The Mahoning Valley and Trumbull Electric  
Railway Companies.**

**Location of Freight and Package Depots.**

YOUNGSTOWN: STREET RAILWAY POWER HOUSE.  
 GIRARD: LIBERTY AND STATE STREETS.  
 NILES: Y. M. C. A. LOT, MAIN STREET.  
 WARREN: No. 106 NORTH MAIN STREET.

Depots are open from 6:00 a. m. to 9:00 p. m. for the receipt and delivery of packages or freight, which will be forwarded on first car leaving depot after delivery of goods at the freight depot.

**ALL CHARGES MUST BE PAID IN ADVANCE.**

**NOTICE . .**

**A**LL PACKAGES MUST BE MARKED PLAINLY WITH NAME AND ADDRESS OF CONSIGNEE. All articles consigned to points located on our line will be delivered direct to consignee without additional charge. We do not deliver goods consigned to points off of our line, and assume no responsibility for goods not called for at time of delivery to point on our line nearest destination, or address marked on package. **SPECIAL RATES GIVEN TO REGULAR SHIPPERS. ALSO ON LARGE SHIPMENTS, ON APPLICATION TO FREIGHT CONDUCTOR OR DEPOT AGENTS.**

FIG. 1.

auditor's half of a corresponding ticket for the Toledo, Bowling Green & Fremont Railway Company.

The Cleveland, Painesville & Eastern Railroad Company now operates 19 miles of track and 19 additional miles will be opened in the spring. A combination car makes two round trips a day and the traffic is handled entirely by the United States Express Company. The passenger fares vary from 5 to 45 cents, the latter being the fare from Cleveland to Painesville. Books of 10 round trip tickets are sold for 10 per cent off the regular round trip fare.

Some of the interurbans have no provisions for carrying freight and transport passengers exclusively. The Greenfield (Mass.) & Turner's Falls Street Railway Company charges 20 cents for a ride of 13 miles with no reductions. The Allentown (Pa.) & Lehigh Valley Traction Company operates 20 miles of track and has a uniform fare of 15 cents. The San Jose & Santa Clara Railroad Company charges 10 cents for a 6-mile ride and a commutation ticket of 30 rides for \$2.00. The San Francisco & San Mateo Electric Railway Company is not permitted to engage in any other than regular passenger traffic. It has 23 miles of track and a 10-cent fare. In Massachusetts it requires a special act of the legislature in order to carry freight on an electric line. The Fitchburg & Leominster Street Railway Company has 18½ miles of track. Within the two cities the fare is 5 cents, 10 cents from end to end of the lines, 11 miles, and 25 cents for a circuit ride of 20 miles with stop-over privileges. Commutation tickets are sold 10 for 75 cents, workmen's tickets 12 for 75 cents, good from 5:30 to 7:30 a. m. and from 5 to 6:30 p. m. School children ride at half fare. The Lowell, Lawrence & Haverhill Street Railway Company has 57½ miles of track and charges 5, 10, 15, 20 and 25 cent fares.

The Aurora (Ill.) & Geneva Railway Company is not per-





## DOUBLE TRUCK CARS FOR THE METROPOLITAN STREET RAILWAY COMPANY.

The Metropolitan Street Railway, of New York city, is having a considerable number of new cars built for its electric service by the J. G. Brill Company, of Philadelphia. These cars are particularly interesting, because they are departures in many respects from ordinary construction. They are also worthy of attention as they are intended to meet the heaviest possible surface traffic and are to be operated under the shortest practicable headway. They are very handsome in appearance and will prove a credit to the road and to the builder.

Externally the features first striking the eye are the great length, which is 28 ft. over the end panels and 36 ft. over the dashers, and the "eureka" maximum traction trucks. The colors are as usual the standard of the road, cream for the concave and orange for the body panel. The dasher is cream color with the iron work black. There are ten windows upon a side fitted with French 26-oz. glass, 28x30 in.

The cars are 36 ft. long over the dashers or 38 ft. over all.



BRILL CAR FOR NEW YORK.

The width of body at the sill is 6 ft. 6 in., and the width at the belt rail 7 ft. 6 in.; the sills are  $6\frac{3}{4} \times 4\frac{3}{4}$  in. The corner posts are 6 in. thick, the window posts  $1\frac{7}{8}$  in. There are five iron carlines in each car. Behind the seat back there is an iron belt on each side going through the car. Under this belt there is a high heavy truss rod; it comes nearly up to the level of the windows rail. At the corner posts long angle irons secure the plates and take a long bearing on them. On the outside of the cars a wide and deep corner plate of pressed steel covers the joints between the letter board, corner post and the head pieces. These corner pieces not only impart great strength to that part of a car corner which is usually weak, but they add greatly to the durability by protecting the joints from the entrance of water. At the panels and belt rail there are other plates completely defending all the joints. The straps on the belt rails and other straps as far as possible are made continuous.

The inside framing is of the usual street car type except that beneath the seats a new feature has been introduced from the steam car practice. This is a truss plank extending the whole length of the car. It is 12 in. wide by  $1\frac{1}{2}$  in. thick, and is gained on to each post  $\frac{1}{4}$  in. It is cambered  $\frac{3}{4}$  in. at each end and bolted down to the sill at short intervals. This practically gives a sill  $18\frac{3}{4}$  in. deep. This adds very greatly to the stiffness of the car and enables the full benefit to be obtained from the use of the inside truss rod. Under the sill a separate truss rod is used which has a single strut in the center. The platforms are 4 ft. from end panel to dasher and are fitted with folding gates which when

turned back, are entirely out of the way. Each dasher has an electric headlight; Sterling brakes are used. These brakes, which are very powerful, are the invention of Thomas Millen, the master mechanic of the road. The inside finish is of second growth white ash. The lumber used was particularly fine in grain and white in color, making a fine effect when finished. The transoms are filled with white chipped glass. There are four four-sided signs on each car. These are operated by hand wheels from the inside of the car or from beneath the hood.

The trucks, as we have said, are of the maximum traction pattern. The large wheels are 33 in. in diameter, and the small ones 20 in. The truck is of the company's standard type and is designed to give a very large adhesion while employing but one motor per truck and in this case the motors are G. E. 1,000, one mounted on each of the trucks. The axles are of cold rolled steel.

## PROPOSED STREET RAILWAY LAW IN OHIO.

A radical street railway bill has been introduced into the Ohio legislature. The bill first provides that no ordinance or resolution to establish or define a street railway route shall be passed, and no action inviting proposals to construct and operate such road shall be taken, and no renewal or extension of a grant shall be made by the council of any city or village having a board of public works, board of improvements or board of control, except upon the recommendation of such boards. No ordinance shall be passed until public notice of the application has been printed. And no grant shall be made except to the corporation that will agree to carry passengers upon such proposed railroad at the lowest rates of fare. No grant for the construction or operation of any street railway shall be valid for a greater period than 25 years, and no renewal shall be valid for more than 15 years; nor shall any renewal of the grant be made until within one year next preceding the expiration of the grant; and during the term of the grant the municipal corporation cannot release the company from any obligation or liability imposed by the original terms of the franchise. An important feature of the bill relates to the extension of tracks. It provides that a company may extend its tracks and make connections with other roads by consolidation, but that the rate of fare shall not be increased either by reason of the extension or the consolidation. Where a road is built between towns the bill gives the right to the company to use the lines of any company which may operate roads in the towns between which the interurban road operates, but it requires the interurban road to obtain from the municipality an additional grant and that the amount of fare charged shall not be in excess of that charged by the local road. A new feature is provided in regard to local roads and the bill gives the right to one company to use and operate its cars upon the tracks of any other company, not to exceed one-third of its length. This is to be done by the approval of the council and the board of public works, board of improvements, or board of control in cities having such an institution. Where the directors of the two companies cannot agree, then the council may step in and fix the terms and conditions by which the cars of one line shall be run over the tracks of another.



## MOTOR TESTING AND INSPECTION.

BY J. R. CRAVATH.

It is now about two and a half years since the scientific testing of electric railway motors began to be used in everyday repair shop work on a large scale, though this practice was by no means entirely new then. The methods have been improved from time to time and the Herrick switch-board system described in the February REVIEW may be regarded as the most complete plan yet offered. There seems to be considerable difference of opinion among railway electricians as to the importance or necessity for testing motor equipments for electrical faults. I have even heard it maintained that an electrical test of a motor equipment was misleading and really told nothing of importance that a competent inspector would not find out by sight and touch. This is putting it rather strong to say the least, but it is well to look matters squarely in the face and find out just what is the proper field for testing and what for inspection. The fact that a marked saving in repairs has been made in every case where systematic testing for electrical faults has been inaugurated shows that under the existing conditions of practice such tests tell more than the sight and touch of an inspector, whatever may be the theory as to what an inspector ought to be able to do.

It is not entirely true that electrical defects are hidden and cannot be discovered by inspection, nor is it true that electrical troubles are all likely to be discovered in the ordinary run of inspection.

The mechanical points of a motor that need watching are principally:

1. Wear of bearings.
2. Lubrication of bearings and gears.
3. Loose bolts.

The electrical troubles most likely to occur are much more numerous, but the principal ones are:

1. Bad brushes and commutators leading up to armature trouble.
2. Oil, grease, dirt and carbon dust in the motor weakening the insulation.
3. Short circuited field coils causing armature burn outs.
4. Armature coils burned out or open circuited.
5. Wires to motor broken or grounded.
6. Motors not equalizing.

It is evident that many of these troubles can be discovered by inspection as well as by testing and the only question is as to which requires the least work and is the most likely to be correct. I think when the matter is fully considered we will see that the testing if not carried out to an extent where \$10 is spent in testing to save \$5 in repairs will show something quicker and easier than any other way.

In looking over the list of likely electrical troubles we see that the first one, that of bad brush and commutator contact, or bad commutator is one that can be easily looked after during mechanical inspection. If the cause of flashing at the brushes happens to be a broken or short circuited armature coil it will sometimes take testing to determine it unless the motor is torn apart, though it is usually the case such coils make themselves known by burning certain bars on the commutator. In either case, whether the burning be due to a defective bar or defective coil, the only relief is by the removal of the armature for repairs so that testing in this particular would be of practical use mainly in the repair shop.

The second point mentioned, that of dirt or oil of any kind endangering the insulation, is one that can usually best be taken care of by an actual overhauling and wiping of the motor. It may be a good plan, however, to make a test as a check on the thoroughness of the cleaning. If the motor is dirty it may show a low insulation resistance in a test and if cleaned it will test up all right. On the other hand it may be so dirty that if left much longer in that state it will break down and at the same time show a test within the limits adopted. There is no way to discriminate in a test between poor insulation due to dirt and poor insulation due to carbonized coils. Dirt may be on the motor, but lacking simply the oil or moisture necessary to destroy good insulation. Considering all these things it seems best not to depend too much either on the insulation resistance test or inspection alone. The wiper may not have done his duty, and if he does not, no one is the wiser until the motor breaks down. If the insulation resistance test shows low it is proof positive that there is something wrong, even though it may be nothing but dirt, and the man making the test can not put it down as right without deliberate dishonesty, which is improbable. If the motor is cleaned before the test is made and poor insulation is shown it locates the trouble either as caused by some dirt or oil that has not been cleaned away or faulty coils, probably the latter.

Under the third head, short circuited field coils, a trouble is mentioned which was at one time and probably is still the cause of numerous mysterious armature burn outs. When a field coil is short circuited on its inner layers it is not always easy to find. It is sometimes possible to discover the defective field coil when a motor is opened up and inspected immediately after a run by feeling the temperature of the different coils with the hand, but very often it is not practicable to make such an inspection and on a large road the car may not be looked at for several hours after it is turned in. Furthermore even if the "feeling" of the different coils is done at once after a run it is the case with hundreds of motors making fast schedule in large cities that all the coils get too hot to hold the hand on long enough to find their comparative temperature. It may be claimed that if the motormen did their duty in reporting peculiar actions of a motor that short circuited field coils would be at once found, but that is too uncertain a thing to depend upon. The most successful system is usually the one that will work fairly well in spite of neglect. Tests will reveal short circuited field coils before they do much damage by burning out armatures and this is probably the most important preventive work the testing outfit can perform.

Armature coils burned out or open circuited generally show themselves at the commutator.

Wires to motor grounded or broken need no testing outfit to discover them.

Whether the motors are equalizing or not can be told roughly from the relative temperatures to the hand of the motors soon after a run, but of course a test would give this more exactly.

The primary object of all testing and inspection of motors is to discover troubles before they become serious, on the "stitch in time saves nine" principle. The main thing to determine is how long the motors will run ordinarily before they are liable to need that stitch in time. Grease cups and commutators need attention every night. Modern motors are so constructed that it is impossible to tell what is going on inside the case unless they are opened. This should be done as often as experience shows that dirt and

grease will accumulate in the case in the service in question, or if the streets are clean and the motor bearings designed thin it may be necessary to open up the motors more often as the bearings require watching and attention. One thing is certain it does not pay to hire men to open up motors oftener than they are likely to need attention. It is a waste of money and muscle. Much depends on the care or carelessness of the men who look at the motors each day. If the daily inspection is not done right no amount of monthly or weekly overhauling will compensate for it, but if it is properly done the length of time between overhauls should be limited only by the life of the bearings and the dirt that will accumulate.

### A PHENOMENAL ADJUSTMENT.

A remarkable instance of accident adjustment has come to our notice, showing what intelligence and energy can accomplish, and forcibly illustrating the value of quick action. We have frequently noted in our columns cases throughout the country, wherein marked ability has been



S. H. BENNETT.

J. H. MULLIN.

shown in this, one of the most important and trying branches of street railway management; but the case before us is so phenomenal that we cannot refrain from commenting at length upon it.

On October 30, 1897, the Atlanta Railway Company, of Atlanta, Ga., was unfortunate enough to experience a horrible head-end collision. An open motor car, drawing a trailer, the two containing about 100 passengers, returning to the city from an inter-collegiate foot ball game, crashed into a closed car, which was also well filled, bound in the opposite direction. The collision occurred at a street crossing, at the base of two hills, just after twilight had given place to darkness, and in an instant the cars were utterly demolished. To render the situation more appalling the electric light at the point of collision, which up to that time had burned brightly, without apparent cause suddenly went out, leaving the wreck in total darkness.

A hurried telephone message from the scene of the wreck advised S. H. Bennett, secretary and treasurer of the railway company, and he at once notified J. H. Mullin, general adjuster for the Southern Department of the Guarantors Liability-Indemnity Company of Philadelphia, with whom the railway company was insured.

These gentlemen hurried to the wreck, and on reaching there a terrifying scene was exposed to view, by the faint

glimmer of the few torches which had been hastily improvised. A morbid crowd, which had been drawn to the scene, interfered with the proper care of the wounded. Many of these had been hastily removed by the army of cabs returning to the city from the foot ball game. In addition to this, many others of the injured found refuge in houses near by. As may be supposed, the omnipresent newspaper reporter was much in evidence, insisting upon being given a list of the injured, and refusing to believe that such request was unreasonable; but worse than the newspaper man was the horde of legal vultures which, as usual, flocked to the scene, intent upon plying their nefarious trade. Under these adverse circumstances it was only possible to secure the most meagre list, which, however, by working all Saturday night was augmented to a total of 35. The next day being Sunday, no legal settlements could be made, but these officials prudently called upon all whose names they had secured and assured them of the company's honorable intentions towards an amicable adjustment. This mode of procedure was of two-fold benefit, in that it produced good feeling towards the company, and enabled these officials to procure the names of many other persons who were aboard the cars at the time of the collision. Before the day was ended their list had been increased to fully 60 names, all of whom were visited without delay.

The wisdom of this course is apparent when it is stated that only four suits were entered against the company, and these by persons whom it was physically impossible to see that day, and before they could be interviewed, their claims had been placed in the hands of lawyers. On Monday, the day following, these two gentlemen began the actual work of settlement, and in the incredibly short time of two weeks, settled with the majority of the injured parties, and so kept in touch with those more seriously injured that the settlement of their cases was also practically attained.

Within a month and a half from the date of this casualty, only four unsettled cases remained, and these, as above stated, were in the hands of lawyers, who resisted reasonable settlement.

By an expenditure of but \$5,000 settlements were made with 55 persons, many of whom had been seriously injured.

It is safe to say that if the adjustment of this matter had not been so skillfully and expeditiously handled, the railway company would undoubtedly have been involved in endless litigation, and eventually have been forced to pay out many times the amount of money actually disbursed, and it has cause to congratulate itself on the results of the good work done by Messrs. Mullin and Bennett.

### TO OUR FOREIGN SUBSCRIBERS.

In remitting for subscription our readers abroad will greatly favor us if they will remit in American paper money where obtainable; draft on Chicago or New York; or if more convenient postal money order in which event it must be drawn on Chicago. We are in receipt almost daily of money orders from across the water, but which are domestic orders and can be cashed only in the country in which they are issued. Where none of the above desired methods are convenient, we will accept postage stamps of small denominations of any country, as we can make use of them; but the domestic money orders which have to be cashed where issued are practically worthless to us.



**BOSTON CONVENTION ANNOUNCEMENTS.**

Secretary Penington of the American Street Railway Association has issued the official circular concerning the Boston Convention. In addition to the date and place of meeting as published in our last issue, announcements are made as follows:

Every applicant is assured that he will get all the space desired, as our resources in this direction are unlimited.

The convention will be held on the second floor of the Exhibit Hall, all stairways leading up from the inside, thus insuring the attention of all delegates and visitors to the exhibits.

The income from sale of space will go to the American Street Railway Association. The executive committee of the Association has fixed the price at 10 cents per sq. ft., and ruled that no space less than 100 square feet will be assigned, but applicants may have as many multiples of this quantity as they may wish, all in one body. Payment for space should be made to T. C. Penington, secretary and treasurer of the American Street Railway Association, 2020 State street, Chicago. Application for space should be made to Charles S. Clark, 8 Oliver street, Boston, chairman committee on exhibits. We hope to have you with us with an extensive display.

The Mechanic Association will not allow any nails or screws to be driven in any floor, woodwork or plaster in the building, so those exhibitors who desire to erect booths must govern themselves accordingly.

All articles intended for exhibition shall be delivered at the building by the agent or owner, and at his expense, but the local committee has made arrangements with Robert S. Brine & Co. to haul and deliver all shipments to the building, if directed in their care.

All electrical connections for power and extra lights must be made at the expense of the exhibitor, and no connection will be permitted except by approved workmen and with the consent of the superintendent of exhibits.

We expect a large exhibit and perhaps it would be in the interest of the exhibitors to make arrangements to have the building open in the evening, as it is well lighted and the electrical companies expect to make a large display.

Space must be applied for by August 1. Assignments will be made as promptly as possible after that date, and exhibitors notified of their location. Exhibits of like character will be grouped together and space will be assigned in the order of application.

It is earnestly requested that all exhibits shall be in place and all work finished by Monday evening, September 5, which is the evening prior to the opening of the convention. Watchmen will be in charge of the premises, so that exhibits will be safe.

All goods should be marked to yourselves, "Mechanics' Building, care R. S. Brine & Co., 33 1/2 India street, Boston," sending them bill of lading or advice that you have shipped goods in their care, giving particulars in regard to shipment, and, if charges are prepaid, they will be delivered to your space in the Exhibition Hall. Ship all goods early to ensure delivery in time.

The headquarters of the association will be at the Hotel Brunswick. The Hotel Vendome is managed by the same parties, and will be used in connection with the Brunswick.

**HOTELS AND RATES.**

Brunswick, American plan.....	\$4.00	per day and up.
Vendome, American plan.....	4.00	" "
Copley Square, European plan.....	2.00	" "
Nottingham, European plan.....	2.00	" "
Victoria, European plan.....	2.00	" "
Turaine, European plan.....	2.00	" "
Parker, European plan.....	2.00	" "
Young's, European plan.....	2.00	" "
Thorndyke, European plan.....	2.00	" "

The annual dinner will be held at the Hotel Brunswick, Thursday, September 8, at 8 p. m. Tickets will be sold at the actual cost to the Association.

The executive committee advises all who desire rooms to apply at once, as the rooms at the Brunswick and Vendome are limited but no rooms will be assigned until March 15, and will be assigned in the order in which applications are received.

Of the hotels mentioned the first five are within five minutes' walk of the Mechanics Building; the others are down town with street cars to the door of the Hall. The usual arrangements have been made with the railroads, tickets being sold on the certificate plan.

The chairman of the committee on exhibits, C. S. Clark, advises us that very probably a track will be arranged so that cars and other bulky exhibits can be run into the exhibit hall on their own trucks.

The Massachusetts Charitable Mechanic Association will hold its 20th triennial exhibition from October 10 to December 3, 1898, and through the secretary of the executive committee having charge of this exhibition, solicits correspondence with parties who will exhibit at the American Street Railway Convention, in regard to exhibiting at the later one also. This committee states it will so far as possible arrange to allow the street railway exhibits to remain in place, if they are desirable, but that early applications will be necessary to secure this privilege. Communications on this subject should be addressed to Henry D. Dupee, secretary, Mechanics' Building, Huntington avenue, Boston.

**THE USE OF STREETS.**

Charles L. Bonney, vice-president of the Chicago General Railway, recently addressed a letter to the street railway companies of Illinois of which the following is an extract:


"I desire to direct your attention to the telegraphic report published in this morning's papers of the decision of the United States court of appeals in the case of the City of Richmond versus the Bell Telephone Company. The case involves the act of Congress of 1886 declaring that the streets of a city are post roads of the United States. The Bell Telephone Company's charter having expired, the city exercised its stipulated right to revoke it, but was enjoined from interfering with the company's poles and wires. The effect of the decision is to modify the injunction so as to prevent the city from driving the company from its streets, but the city is to retain its police power over the same.

"This decision of the federal courts is in harmony with the suggestions of the undersigned sent to you with the 99-year extension bill, proposed for the next legislature, and makes the distinction between the physical property of the company in the street and the police regulations of the use of the property. This decision will be found very useful in educating the public to the law as it is, and it should be carefully considered by all street railway companies in Illinois before the meeting of the state association in Chicago in May."

**A MOTOR OPERATING IN COURTROOM.**

The General Electric Company brought suit against E. G. Bernard & Co., of Troy, N. Y., for using a motor with a winding which infringes on one of its patents. The Western Electric Company, of Chicago, is behind the defendant. Many drawings were exhibited in the court room and a motor was set up and put in operation to demonstrate its principle.

The program of papers before the Western Society of Engineers for the first half of 1898 has been issued and announces 16 papers on technical subjects and two illustrated lectures.



# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

The capacity of the new power house of the Capital Traction Company, Washington, D. C., will be considerably greater than it was at first contemplated. There will be five horizontal tandem compound Allis Corliss engines, 20 and 40x42 ins., running condensing and direct connected to 550-k. w. General Electric generators, giving 600 volts at 100 r. p. m. For the long feeders there will be three 100-k. w. General Electric boosters. There will be four batteries of Cahall-Babcock & Wilcox boilers.

\* \* \*

Although the original design of the power station for the Chicago elevated loop contemplated the burning of coal and the equipment included mechanical stokers and ash-handling apparatus as noted in the REVIEW for January, 1897, the fuel used will be oil. Storage tanks and pumps have been installed and the oil piping system, which is in duplicate, is practically completed. One of the 2,000-h. p. units is in place and has been in operation for six hours per day, from 6 a. m. to 9 a. m. and from 4:30 p. m. to 7:30 p. m., during the past few weeks. One of the generators, which were built by the Siemens-Halske Company, was illustrated last December.

\* \* \*

The data of the tests made on the power plant of the Chicago Electric Traction Company, published in the February REVIEW, serve to forcibly point out that the proportion of steam generated which is used in the auxiliary station apparatus is very large, and consequently there is a correspondingly large saving to be made by substituting electric motors for steam cylinders for driving the auxiliaries. The dry steam used per hour by the large engines in this test was 3,903 lbs. and the indicated horse-power 217, making the water rate 18 lbs. per i. h. p. per hour. The auxiliaries used steam (corrected for moisture in the steam) as follows:

Economizer engine . . . . .	38.4 lbs. per hour.
Stoker engine . . . . .	36.4 lbs. per hour.
Air and feed pumps . . . . .	685.0 lbs. per hour.

Total . . . . .	759.8 lbs. per hour.
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This is 19.4 per cent of the steam used by the engines; this figure does not require extended comment.

It is true that in this case the exhaust from the pumps was used to heat the feed water and thereby the fuel charge against the pumps was reduced from 14.3 per cent (the proportion of the total water evaporated used by the pumps) to 5.1 per cent. However, since there is an economizer provided, the function of which is to heat the feed water, the gain from this source should have been made in the economizer, and the fact that the pumps used more than one-sixth as much steam as the engines driving the dynamos remains the significant feature.

One of the essentials in making an engine test is to have an accurate reducing gear for transmitting motion from the crosshead to the indicator drum, and all who have had to prepare for a test appreciate the annoyance caused and time lost by the necessity of attaching, and perhaps repairing, the temporary rig found in the majority of power stations, which between times is stored away somewhere to gather dust and get lost or broken. There would be economy and increased accuracy in having a well designed reducing motion permanently attached to the engine, and such are to be found in a few plants. This is the case in the power house of the Chicago Union Loop, each engine being equipped with a permanent rig. The description of the device, which gives a theoretically perfect motion, is as follows:

A shaft parallel to the piston rod is supported in bearings bolted to the under side of the upper guide, and so located that the shaft is sufficiently to one side to clear the crosshead and close to the guide frame so as not to prevent free access to the crosshead, stuffing box, etc. To the shaft is fixed a brass strip so curved as to form a portion of a helix or thread of very steep pitch. A fork provided with rollers is bolted to the crosshead and engages the helical strip. The proportions are such that the movement of the crosshead throughout the stroke of 60 in., the fork being in contact with the helix, rotates the shaft through an angle of something less than 60°. On brackets fastened to the side of the cylinder is a second shaft parallel to the other one with light wheels mounted on it about which the indicator cords are wound. Motion is transmitted from the first shaft to the second by means of two cranks and a connecting rod, the cranks being of equal length and parallel.

\* \* \*

Some months ago two Parsons steam turbines, direct connected to generators, were installed at the Blackpool (Eng.) Corporation electrical plant for furnishing power to the street railway. The transformation of this road from conduit to overhead trolley, now in progress, was contemplated at the time and one change provided for was the raising of the voltage from 250 to 500 volts. This was accomplished by making the new units each consist of a multiple expansion "parallel flow" Parsons turbine of 100-k. w. capacity, and two 50-k. w. dynamos, each giving 200 amperes at 250 volts. For the low voltage working the dynamos are connected in parallel and for the working of the overhead line they will be connected in series. The turbine and the dynamos are mounted on a bedplate of the twin girder type, and the dynamos are arranged to slide in the direction of the shaft so that the armature of the one adjacent to the turbine may be withdrawn by sliding the other dynamo along the bedplate which may be readily done. The coupling of the turbine and generators is by means of square sliding sleeves fitting loosely over the squared ends of the shafts.



In appearance the turbo-generator is very like that illustrated in the REVIEW, July, 1897, a second dynamo being added. The turbine takes steam at 120 lbs. absolute and expands it to  $1\frac{1}{2}$  lbs. The governor is an electric one in which the solenoid is connected to the first dynamo only. The floor space occupied by each 100-k.w. unit is  $42\frac{1}{2}$  sq. ft.; the weight is about 13,500 lbs.

Tests at the maker's works placed the steam consumption at 26.8 lbs. of steam per k. w. h. at full load and 29.9 lbs. at half-load, a rise of 11.5 per cent. The operation of these machines is reported to be satisfactory.

\* \* \*

In England there are a number of towns which conduct their own electric lighting plants, and which have refused to grant locations to tramway companies unless the latter agree to purchase their power from the towns; there are also cases of tramway companies which find it advisable to buy rather than generate their power. The result is that the question, What is a fair price for tramway power? is a burning one at the present time. From the point of view of the lighting plant, with power to sell, it is urged that the load factor of tramway plants is much less than in lighting plants, and the fluctuations more violent, so that because of a larger investment for machinery and heavier charges for repairs, current for tramways should sell for more than does current lighting. The tramway company argues that the time element is the most important one, and that the tramway plant would be running at a good load fully three or four times as many hours in the 24 as would the lighting plant, and therefore, current for this purpose could be sold cheaper. In this it is assumed that the cost of producing the current at the switchboard is considered and the charges on the lighting company for installing and maintaining its mains are not included.

No doubt the better load factor and the steadier load claimed for the lighting service are compensated for by the longer time during which the tramways would be operating, but it would seem that the fact which should determine the comparative price of the tramway power is whether the periods of heavy load in the two kinds of service come at the same or at different times. If they are at different times, so that to a considerable extent the same machinery may be used in each, a substantial reduction in the cost might be made, but if they occur at the same time so that the capacity of the station must be correspondingly increased no cheaper power can be reasonably expected.

The prices obtained for electrical power by the English stations seem very high when compared with American costs. It is estimated that "in the Midlands, with coal at the door, a million units (k. w. h.) per annum for traction purposes might be sold for 3 cents per unit, but in other parts of the country it could not be done for less than 4 cents."

\* \* \*

#### Reserve Machinery and Fuel and Water for Emergencies.

In a power station there must always be machinery in working order, and to speak figuratively, food and drink for it, that is, fuel and water. Accidents will always happen, sooner or later, and the fundamental rule not to trust a road to a single piece of apparatus is well understood and followed, and it is rare indeed that a road is completely disabled by reason of accidents to the machinery. Scarcely

anything, aside from a failure of all the machinery, will tie up a plant more quickly than a failure in the feed water supply. A coal shortage can be seen beforehand and a supply of fuel of some sort or other secured, but a water famine results from the unforeseen and the unexpected. A fuel famine is most seriously felt because it increases the cost of operation, while a failure in the water supply shuts down the road; such a stoppage often gives it a bad name and may injure it very seriously.

The mining and railroad strikes which occur at more or less frequent intervals, lead companies, particularly the large ones, to protect themselves by inserting the proper clauses in their contracts for fuel so as to get the same rate independent of the market price. Storage place is provided and at the first signs of trouble the contractor is called on to furnish coal enough to form a safe reserve.

When it is at all feasible to locate the power station close to running water it is done and then as a rule the feed is drawn from this source. In the great majority of cases connections to the city water mains are relied upon for emergencies. Where this latter is the source of regular supply, and sometimes when it is not, artesian wells are dug at the station, and in some instances storage tanks are built.

We give here some of the replies received to inquiries regarding the machinery reserve and coal and water supplies for emergencies. The roads have from 20 to 180 cars; nearly all of them have but one power station. The history of the road, whether it has had a rapid growth in the way of extensions after the first installation, and the date of the building of the station, no doubt have much to do with the number of units in reserve.

1. This is a 14-mile road with 20 motor cars. The power station equipment comprises three engines driving two 80-k. w. and one 200-k. w. generators. Either the two small units or the one large unit will care for the ordinary output, and usually the two small ones are in reserve. There are three return tubular boilers, one being always in reserve. Jet condensers are used and the water supply drawn from the river. In case of failure to supply the condensers, water for the boilers may be pumped from the river or drawn from the city mains. Coal is delivered as used, two car loads per week, and storage space is provided for nine car loads, which is sufficient for a month.

2. This is a 20-mile road operating 20 motor cars. In the station are three 150-h. p. engines and three 100-k. w. generators, of which one unit is in reserve. There are four water tube boilers, one in reserve. Coal is purchased as needed but the fire room is large enough to store 600 tons when it is desired to carry a stock. The feed water is ordinarily drawn from the city mains, but there is an artesian well for emergencies.

3. This is a 31-mile road with 76 motor cars. In the station are three water tube boilers rated at 400 h. p. each, and three engine-generator units rated at 400 h. p. each. Two units are sufficient for the average output. There is storage capacity, under a shed, for 700 tons of coal and a stock sufficient for two or three months is always kept on hand. The ordinary source of water supply for the boilers is a pond near the station, but in emergencies water may be pumped from the river or taken from the city mains.

4. This road has 60 miles of track and 115 motor cars. The total capacity of the station is 3,250 h. p., there being five 500-h. p. units and one 750-h. p. unit. The average

## Street Railway Review

COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION.	MONTH.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel per k. w. h.	Price of Fuel per Ton of 2,000 Lbs.	Kind of Fuel
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.	Total.						
1.....	Dec.	1,409,880	.284	.182	.031	.024	.067	.588	3.5	1.5	10.1	2.8	\$2.03	Bituminous.
2.....	"	147,970	.447	.355	.129	.....	.034	.965	6.55	7.19	7.09	4.14	2.16	"
3.....	"	292,824	.431	.194	.032	.012	.....	.669	3.55	5.2	.....	4.05	2.13	"
4.....	"	376,975	.398	.168	.026	.003	.....	.595	3.4	4.9	.....	3.68	2.16	"
5. Metropolitan Elevated, Chicago.	"	1,837,766	.368	.126	.021	.012	.068	.595	6.0	2.1	5.13	3.71	.....	.....
6.....	"	531,390	.796	.231	.079	.....	.114	1.220	.....	.....	.....	.....	.....	Oil.
8.....	"	930,496	.495	.401	.067	.....	.028	.991	.....	.....	.....	.....	.....	.....
9.....	"	208,370	.553	.252	.080	.....	.036	.921	.....	.....	.....	.....	.....	.....
10. Metropolitan, Kansas City, Mo., Central Av.	"	344,537	.292	.131	.003	.007	.014	.447	1.65	1.57	.....	4.73	1.20 to 1.40	Bituminous

output it 2,000 electrical horse-power and the maximum 2,800, so that there are always one or two units in reserve. The boilers are in four batteries of 500 rated h. p. each, and three batteries are ordinarily fired. A six months' supply of coal is carried on hand. The water supply is ordinarily taken from the river but the city water is available for emergencies.

5. This road has 61 miles of track and 158 cars. The total rated capacity of the engines is 2,275 h. p.; there are two engines direct connected to 500-k. w. generators and three 150-k. w. belted units, all of which are in use during the periods of very heavy traffic, but usually about two-fifths of the station capacity is in reserve. There are 10 water tube boilers of which from two to four are in reserve. Coal is usually delivered on the power station track in daily lots, but there is ample room in the yard for storing 2,000 tons in case it is desired to lay in a supply. Feed water is drawn from the river ordinarily; for emergencies there are connections to the city mains.

6. This is an interurban road 27 miles long with 21 motor cars which are all double truck cars. There are two power stations each equipped with two 250-k. w. generators driven by Allis simple engines. Ordinarily one unit in each station furnishes sufficient power. In one station are three 250-h. p. Stirling boilers and four in the other; two boilers in each station are fired. There is storage room at the two stations for 20 car loads of coal. Water is drawn from the river which is the sole source of supply; the pumps and piping are in duplicate.

7. This road has 26 miles of track and 30 motor cars. There are two compound condensing engines rated at 300 h. p. each and three generators aggregating 520 electrical horse-power; of these one engine and one generator are in reserve. The boiler equipment is small, there being but two horizontal return tubular boilers. The heaviest traffic on this road is in the spring and summer when it is necessary to use both boilers; during the fall and winter only one is used. Coal is brought direct from the mines and shipped as used, two cars per week in summer and six per month in winter. The side track to the station is on a trestle, and the space underneath has been converted into a coal bin with capacity for 360 tons; this much is kept on hand when there is reason to anticipate any difficulty in securing a regular supply. Water for the condensers is drawn from the river, the feed being taken from the condenser hot

well; there are also connections to the city mains and a separate pump for drawing water from the river.

8. This road has 16½ miles of track and 53 motor cars. In the station are two 300-k. w. direct connected units, one being in reserve. There are two 300-h. p. boilers. The boiler room is large enough for storing 200 tons of coal. The feed water supply is ordinarily drawn from the city mains. For emergencies there is a tank holding 25,000 gals., and also a pipe laid to a neighboring creek.

9. This road has 50 miles of track and 104 motor cars. In the station are two 350-k. w. and one 200-k. w. generators each driven by its own engine; one unit is in reserve. There are eight horizontal tubular boilers rated at 125 h. p. each; these are run four at a time for 30 days and then cleaned. Coal is received in lots of from 600 to 700 tons, and stored in the yard, which has a capacity for 2,000 tons. Feed water is taken from the city mains; there are two tanks, each holding 2,000 gals. which in emergency would supply the station for a short time, until repairs could be made.

10. The engine room equipment of this station comprises two engines, one of 350 h. p. and one of 500 h. p., and five 80-k. w. generators. There are three Heine boilers rated at 250 h. p. each. One engine, one generator and one boiler are in reserve. The coal storage capacity is about 700 tons. Water is taken from the river ordinarily, with connections to the city mains also.

11. This road has 80 miles of track and 180 motor cars. In the power station are nine engines and 15 dynamos. Three of these are tandem compounds, each driving two dynamos; three are cross compounds, each driving two dynamos; three are simple engines, each driving one dynamo. Thirteen of the generators are of the same size, 100 k. w., and two are of 150 k. w. capacity. There are seven boilers of from 200 to 400 h. p. (rated) capacity, the total being 1,975 h. p. The rated capacity of the electrical machinery is 1,600 k. w. but it is frequently necessary to work it at 50 per cent overload. The average load on the station is heavy enough to require all of the engines except one of the smallest, so that there is practically no reserve. Similarly the boilers are all operated continuously except such as are being cleaned or repaired. Neither is there any storage capacity provided for coal, it being delivered daily. Water is drawn from the river through a race, with connection to city mains for use when the race is too low or too muddy to use.



12. In this plant there are four engines and seven generators. The engines comprise one of 1,000 h. p., two of 1,200 h. p., and one of 1,500 h. p.; the generators, one of 800 k. w., four of 500 k. w., and two of 200 k. w. To care for the average output a capacity of 2,300 k. w. is needed so there is 900 k. w. in reserve. Two engines are in reserve. In the boiler room are 18 boilers 17 ft. by 72 in., of which 14 are ordinarily fired. Coal is delivered to the station as needed; when it is desired to keep a stock on hand it is stored in an open lot, there being room for about 1,000 tons. Water is drawn from the river or from artesian wells; there is a 20,000-gal. tank for emergency use.

13. This road has 67 miles and 100 motor cars. The total rated capacity of the station is 2,500 h. p.; one unit of 900, one of 800, and two of 400 h. p. The ordinary output is from 900 to 1,300 k. w., leaving two units in reserve. There are six boilers, three rated at 150 and three at 250 h. p.; five of these are ordinarily in use. Bins holding 1,000 tons of coal are provided under the railroad switch for storage purposes. Feed water is taken from a creek; for emergencies there is a tank with a capacity of 150,000 gals.

\* \* \*

**The Peck & Patterson Furnace for Coal Dust.**

The accompanying illustrations show the coal dust furnace patented by Peck & Patterson, 308 Second avenue, Pittsburg, as applied to return tubular boilers. To burn coal dust successfully the combustion chamber must be separated from the boiler so that the cool surface of the latter will not prevent the complete combustion of the gases in

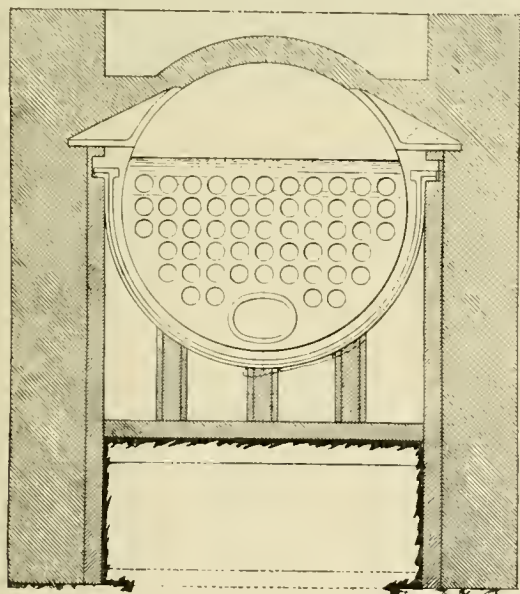


FIG. 1.

contact with it. In this furnace the boiler is encased throughout the entire length with a covering of fire clay or other suitable material. This casing extends about three-fifths of the distance around the boiler, or to the water line, and is placed about two inches from the boiler. The entire furnace is lined with fire-brick. The casing, consisting of single fire-clay rings, and joined together hermetically, is

made to conform to the circle of the boiler, each end of the rings being provided with a flange which rests in the side wall, and is supported by arches as shown in Fig. 1.

The center of the furnace, or bridge wall, is one-third the length of the boiler, and is divided into four spaces, or throats. The expansion chamber is fitted with a deflecting plate at the end of the boiler. It will be seen that the furnace consists of three compartments, viz.: the combustion chamber, throats or bridge, and expansion chamber.

This furnace is devised for the use of powdered coal which is pulverized and fed into the furnace as required. The feed can be adjusted by suitable valves in the pulverizing ap-

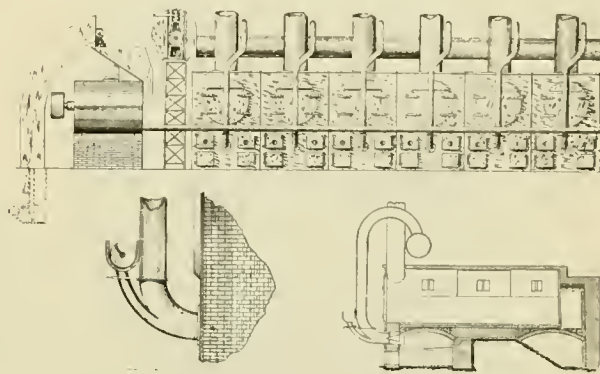


FIG. 2.

paratus, at will of the operator or fireman. This coal enters at the front of the furnace, or combustion chamber, through a specially devised spreader, together with the air required for combustion. Upon entering the furnace, the coal dust ignites at once and complete combustion rapidly ensues.

The gases enter the expansion chamber at the rear of the setting and thence are carried through the tubes to the stack. The ash resulting from the burning of the dust strikes a deflecting plate in the expansion chamber and is thrown into the lower part of the chamber where it remains until removed.

Fig. 2 shows a battery of boilers equipped with the Peck & Patterson apparatus. There is an air main carried over the front ends, with pipes to each furnace; a blower furnishes air under sufficient pressure to carry the coal dust into the furnace. The coal crusher is located convenient to the supply and the powdered coal is carried along an open trough in front of the boilers by a screw conveyor. The supply to each furnace is regulated by a valve in the branch pipe.

The advantages claimed for this furnace are: the combustion is more perfect, giving a substantial saving in fuel; the cheapest grades of coal may be used; a more uniform distribution of heat, the heat reaching the boiler shell only by radiation from the fire-proof casing; it is smokeless.

The furnaces are provided with grates of the ordinary type for use in emergencies. The furnace can be adapted to water tube boilers, in which case the combustion chamber is separate and located in front of the ordinary setting.

One of these furnaces has been in experimental operation for over three months in a Pittsburg plant, and has given very satisfactory results.

The Consolidated Traction Company, of Jersey City, has issued an order that newsboys will not be allowed to board the cars in the future.

### THE THIRD RAIL SITUATION.

The "Daily Herald" of New Britain, Conn., reports the president of the Boston & Maine Railroad on the subject of the third rail as follows:

President Tuttle, of the Boston & Maine, has been talking interestingly with the Boston representative of the Springfield Republican, on the future of the third rail electric system. He did not regard the third rail system as beyond an experimental stage in any part of the country. The Nantasket railroad, operated by the Consolidated, is to be regarded as still an experiment, and so is the third rail line from Hartford to New Britain. These seem to operate successfully, as far as they go, but they do not meet the problems of the main lines of railroad where there is a large amount of local and express passenger travel and of freight transportation. Thus far the third rail has operated light

Tuttle, of the Boston & Maine road, is not so enthusiastic about the third rail as some of the Connecticut railroad men. He can see very easily how single and detached cars can be propelled by the new power, but he cannot see how it can be used to furnish passenger or freight trains with force sufficient to move them. This is the problem at present, and it is bothering more people than President Tuttle. So far the only practical result of the third rail experiment is to furnish a method of competition with the trolley. And the most peculiar feature of the situation is that the railroads would never have dreamed of furnishing the facilities offered by the third rail as long as they had a monopoly of the travel. When the trolley began to do business, the steam railroads began to think of the needs of the dear public."

To us it appears that the problem of working powerful electric locomotives is not so serious as is indicated in the



VESTIBULE ON LINDELL RAILWAY, ST. LOUIS.

trains running for comparatively short distances. If the solution of the problem could be reached by breaking up the present local passenger trains into single car service, with such motor power as is now available, it could be solved easily. But to do it, under the present system of operating railroads, would require the construction of a new track for that particular business. As it is now, a local passenger train may be followed in a short time by an express as soon as the passenger is out of the way. After the express may come a long freight train. Both the express and the freight require far more power than can be given by any motors now in use. Electric transportation requires the breaking up of local trains into such small parts as will interfere with the freight and express passenger. The problem is not only the division of the power now used for local passenger trains into sufficiently small portions for the frequent running of single cars, but there must be secured, also, if the same tracks are to be used, sufficient power for the large trains. This step has not been taken yet, and hence, in a broad way, it is perfectly true that the system of electric transportation, as applied to the steam roads, is yet in an experimental stage.

The "Herald" then comments editorially: "President

foregoing extracts. The Baltimore & Ohio Railroad has demonstrated that the most powerful freight locomotives can be successfully operated on the overhead trolley system, and the third rail presents less difficulties than does the overhead wire.

### A ST. LOUIS VESTIBULE.

The illustration is from two photographs showing views of a car recently fitted with vestibules in the repair shops of the Lindell Railway Company, of St. Louis. Vestibules have been placed on this car for an experiment, and if they are favorably considered other cars will likely be equipped. The vestibules are similar on each end, and necessitated some slight alterations to the dash and roof of the car as may be seen in the cut. The approximate cost per car is \$100. We are indebted to the general superintendent, G. W. Baumhoff, for the photographs.

Two cars of the Wheeling (W. Va.) Railway Company had a head-end collision in a dense fog. Four of the employes on the cars were painfully injured by flying glass and splinters.



## WOMEN AS STREET RAILWAY SUPERINTENDENTS.

By Anna E. Mitchener, Superintendent of the Tuscarawas Railroad Company.

Basing my views on a brief but quite successful experience I would say that street railroading is a useful and fascinating work, one wherein a woman may use originality and tact at all times. The street railroad is first and foremost a public servant, and in that capacity one must study the public with which one has to deal. For all publics are not alike, and as far as the particular style of public to which one caters is pleased, just so far will one meet with success. A street car line must have the good opinion of the people or it will be an absolute failure, and to gain that good opinion it must have a steady, reliable car service and, above all, trustworthy motormen and conductors. As a matter of course, to have good car service means to have as good cars as one can get, and thoroughly capable men in the power house, but it is of the latter condition, motormen and conductors, that I want to speak now. These men should be selected with the greatest care, for—especially on an interurban line—a great deal depends on them. The motormen should be the kind of men that make good soldiers—with a quick eye, a steady nerve, a strict attention to duty, and should know well how to obey without questioning. Conductors must be equally able to deal with a disorderly crowd or to assist the aged and helpless, thus combining two great powers, strength and tenderness. Of course, only temperate and honest men should be employed in any way by a street car company.

Believing, as I do, that so much depends upon the men, it is necessary, after making a careful selection, to employ the best methods of inducing them to do their best. And I have found a mutual respect a great incentive in that line. To be met on an equal footing, to be made to feel that one gets credit for honest effort, and to know that mistakes, when they are really accidental, will be treated kindly and quietly by the employer, does much toward awakening the better qualities in a man, and that being done, the rest follows, naturally. It has been my constant endeavor to make our employes feel that what benefits the road benefits them, and thus they put forth their best efforts. Above all else they must understand that any work wherein a number of men are employed, must have a head, and that it is their duty to obey that head implicitly. Men are prone to think that a woman knows nothing about law and order, and obey her simply because she is a woman, but perseverance will gradually win a way into their confidence, and when that is gained the greatest difficulty has been overcome. With a large force of men ready to obey, on the instant, any orders that may be given them, there is a feeling of safety in the face of the gravest danger.

Any woman may take up railroading and make a success of it; for I believe that it is a position for which women are well fitted. A quick brain, dependence upon one's own judgment, and a strict observance of the rules of law and order will, with some knowledge of business principles, be found the chief requirements. Constant contact with humanity will broaden one's views, and the ever varying phases of railroad business will brighten one's intellect to such an extent that such a position affords a wide field for doing good—that one thing, above all others, that women wish to

do. And I hope soon to see the day when women will understand the benefits of and take their place in positions that offer such benefits both to themselves and to humanity.

Miss Anna E. Mitchener, who has for the last six months occupied the position of superintendent of the Tuscarawas Railroad Company, was born in Indiana in 1877, but removed with her family to Salt Lake City when two years old, and her childhood was spent on the shores of that inland sea. In 1891 her family removed to New Philadelphia, Ohio, where Miss Mitchener attended the High School and was graduated in 1894. The follow-



MISS ANNA E. MITCHENER.

ing fall she entered the Moravian Seminary at Bethlehem, Pa., expecting to pursue a classical course, but was obliged to withdraw after six weeks of study because of the failure of her eyes.

In June, 1896, her father, C. E. Mitchener, completed arrangements for the construction of an electric railway connecting New Philadelphia and the "twin cities" of Uhrichsville and Deunison. Miss Mitchener assisted her father in his correspondence and clerical work, and in this way became acquainted with the road in its infancy and gained in knowledge of the railway business as it grew to completion. From the date of its opening, September, 1896, she has been in the office and when her father was called away on an extended trip in November last he decided to leave the work in her hands. Since then she has filled the office of superintendent and has met with marked success in every way.

### NEW MISSOURI INTERURBAN.

The Hannibal, Palmyra & Suburban Electric Railway has been organized with a capital stock of \$275,000 to purchase the present street railway in Hannibal, Mo., and build extensions. These will be to South Hannibal, the Cemeteries and Hannibal Cave, about 2½ miles; to Oakwood, about 1½ miles, and to Palmyra, about 10 miles.

D. Thomson, of Hannibal, also advises us that the company will build a steam heating plant to supply the business section of the city with heat from the exhaust of the power station. Street railway, power and heating franchises for 33 years have been secured. A bond issue of \$200,000 has been authorized and will soon be placed on the market.

The safe in the office of the Buffalo & Williamsville Electric Railway Company was blown to pieces and the office destroyed. As there was no money in the safe the mission of the robbers was in vain.

**STRIKE AT SEATTLE.**

The conductors and gripmen of the Front Street Cable Railway Company, Seattle, Wash., struck for an increase of wages to 22½ cents per hour. There are 22 men running six trains on the line which is a particularly hilly and circuitous one. Three years ago when the patronage was poor on account of the hard times the uniform scale of wages was reduced from 22½ cents to 20 cents per hour to those who had been in the company's employ for more than a year, 19 cents for those between six and 12 months, and 18 cents for those under six months. The men thought the increased patronage justified a return to the old rate, but Receiver Colvin did not look at it that way and employed new men to run the cars. On account of private business affairs W. M. Caldwell, the superintendent, has severed his connection with the company.

**HIGH SPEED ON THE LORAIN & CLEVELAND.**

The Lorain & Cleveland Railway has made some remarkable records for high speeds. This line is 26½ miles long running from Lorain to the Public Square in Cleveland; from Lorain to Rocky River, about 18 miles, the company owns the fee of the right of way. This portion of the line is single track with turn-outs, and is practically devoid of curves and grades; it is laid with 70-lb. rails. From Rocky River to the Cleveland terminus, cars are operated over city tracks.

The regular schedule time for the whole distance is 90 minutes, but the necessity of conforming to the city headway from Rock River to the Square makes the schedule speed on the single track line about 30 miles per hour, including all stops. The following is a copy of the record of speed tests recently made.

Going West.	Time.	Distance.	Minutes.	Miles per Hr.
Lv. Rocky River double track	12:10½	3.56	5½	39
Ar. Dover Switch	12:16			
Lv. Dover Switch	12:17	4.52	6	45.1
Ar. Mitchell Switch	12:23			
Lv. Mitchell Switch	12:24	2.44	3	48.8
Ar. Avon Beach Park	12:27			
Lv. Avon Beach Park	12:28½	1.39	1½	55.5
Ar. Sheffield Switch	12:30			
Lv. Sheffield Switch	12:31	4.91	7	42.2
Ar. Reverse Curve	12:38			
		16.82	23	43.8
Going East.				
Lv. Reverse Curve	1:48	4.91	6	49.2
Ar. Sheffield	1:54			
Ar. Avon Beach Park	1:56	1.64	2	49.2
Lv. Avon Beach Park	1:59	2.44	3	49
Ar. Mitchell	2:02			
Lv. Mitchell	2:15	4.52	6	45.1
Ar. Dover	2:21			
Ar. Double Track	2:27	3.84	6	38.5
		17.35	23	45.5

It will be remarked that the time going east was the same

as the time going west, but that the distance is .53 mile greater going east. General Manager F. W. Coen says, in explanation of this, that all the switches are on the north side of the track and are taken going west, while going east the entire distance is straight track. The highest speed for any distance was 55.5 miles per hour; this was made on straight and level track between switches. This speed and the speed of 45.5 miles per hour for over 17 miles are believed to be the highest as yet attained on electric street railways.

**PAN-AMERICAN EXPOSITION POSTPONED.**

Buffaloians have abandoned the idea of holding a Pan-American Exposition near that city in 1899, owing to the lack of financial support of the scheme. It will be remembered that Capt. John M. Brinker, president of the Niagara Falls & Lewiston Railway Company, is president of the Pan-American Exposition Company, and that W. Caryl Ely, president of the Buffalo & Niagara Falls Electric Railway, was selected as director general of the project. The status of the scheme is recited in the following official statement:

"While the progress made in the financial arrangements for the Pan-American Exposition has been of a very satisfactory character, and the interest manifested by the citizens of the various communities on the Niagara frontier has been most encouraging, the immediate development of the project has been arrested by the unsettled condition of the public mind because of the Spanish-Cuban complications and the consequent apprehension of war. On account of this condition of public affairs it is believed by those best able to judge that at the present time it would be practically impossible to secure from Congress that recognition for the exposition which is considered eminently desirable to insure its success. It is not improbable, however, that the condition of material affairs may before long assume a more pacific phase. If this proves to be the case, the question then confronted will be 'Will there be sufficient time left in which to carry out the exposition in a comprehensive and effective manner upon the lines hitherto contemplated?' Possibly the answer may be in the negative, but even then it by no means follows that the project will have lost its vitality. A postponement of the time of holding the exposition for a year or even until 1901, may be found expedient. Those originally interested in the enterprise will not definitely abandon it until every means of carrying it to a successful issue have been abandoned."

**MIDDLETOWN-GOSHEN TRACTION COMPANY.**

The Middletown-Goshen Traction Company of Middletown, N. Y., has defaulted in the interest due January 1, on the first mortgage bonds, and a foreclosure is imminent. To save the expense of such a proceeding the company and the bondholders have agreed to pay creditors 25 per cent of their claims in full settlement before May 1, 1898. Nearly all of the creditors have accepted these terms. The unsecured liabilities amount to \$32,000. Those desiring to join in this arrangement should notify Wm. B. & H. B. Royce, 75 North street, Middletown. The bondholders' committee consists of Robert Wetherill, David A. Hunter and William S. Grant, Provident building, Philadelphia.



## NOISELESS ROLLING STOCK.

The REVIEW has called attention to the desirability of noiseless rolling stock for electric railways, and now the Chicago City Railway Company has built a car with that conception embodied in every element of design. C. E. Moore, master mechanic, worked out the details of the car, and President Bowen was so well pleased with the idea that he decided to have the car built and give it a thorough trial.

In the general dimensions of the body the car is the same as the standard closed car of the company, with the addition of the vestibules at the ends. The exterior is painted in the different shades of green, but in other respects it resembles the standard car, as may be seen in Fig. 1. Fig. 2 shows the interior of the car, which is very attractive. The car steps are covered with rubber matting and the floor with coca mats so arranged that the doors to the motors can be easily opened. Beneath the mats and extending up under the seats is a covering of "linoleum," which is extensively

facturing Company. The curtains are of special make of tapestry with Forsyth fixtures.

In each window casing is a push-button, to be used by the passengers to notify the conductor to stop the car. The buttons are connected to four dry cells under the seats to two bells, one in each vestibule. The motorman is instructed to pay no attention to any such signal, as the usual gong is provided for signals to start and stop the car.

The Carter momentum brake is used on this car. The brake staff is connected to a short horizontal shaft and bevel gears, as may be seen in the illustration. This alteration was made so that the brake staff could be placed close to the dash and not obstruct the passageway.

The most striking peculiarity of the car is the decoration, especially in the interior. No natural woods show in any part, every bit of wood work being painted in some harmonious shade of green. The decorative figures are all made with stencils, and the effect is very pleasing. By this system of painting, cheaper grades of lumber, and lumber that is

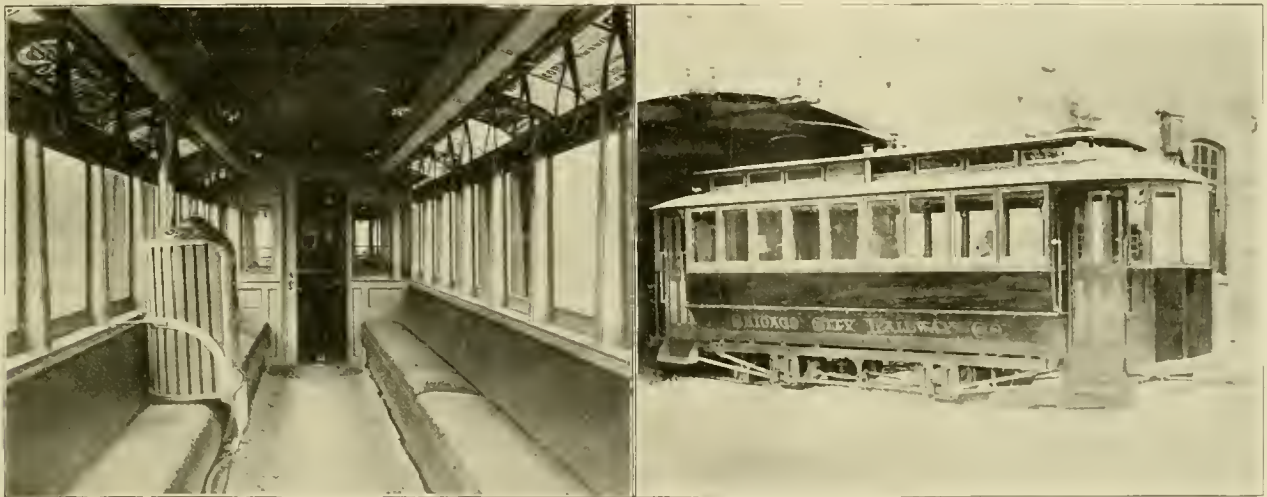


FIG. 2.—NOISELESS CAR, CHICAGO CITY RAILWAY.—FIG. 1.

used on hotel or corridor floors to deaden sound. Here it prevents the transmission of the noise of the wheels and motors into the interior of the car. The panels beneath the windows and in the roof of the monitor are stuffed with mineral wool. The mineral wool is placed in paper sacks cut to fit the hollow panels and pushed into place, and this effectually prevents any drum-like vibration.

The windows are all fixed, which in some cases might be an objection, but as it is only desirable to have windows open for a few days in the spring and fall, open cars are put in service as soon as the weather will permit, it was thought that the freedom from rattling and the greater warmth would more than compensate for the fixed windows. The small windows in the monitor provide for ventilation. The glass is set in rubber in the sash, and the sash is lined on the outer edges with strips of rubber  $\frac{3}{8}$  in. square. The doors are hung on rollers at the top instead of rolling on a track at the bottom. The track is off-set at either end so that when the door is fully opened or closed it is let down on a flange at the bottom and rests on a rubber strip. The arrangement of the doors and windows makes the car unusually free from vibration and warm in winter. The heat is supplied by a Columbia stove, made by the McGuire Manu-

off-color can be used. While the first cost of painting is a little greater, it is believed that the test will demonstrate that the maintenance charges will be less.

The motors are the standard Westinghouse 12 A, 30 h. p., and the controllers are the General Electric K2.

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**VAN DORN'S LATEST.**

W. T. Van Dorn, of the W. T. Van Dorn Company, Chicago, whose couplers are standard on so many roads, has just brought out a new invention which has received the strongest endorsement from every steam and street railway man to whom it has been shown. It is a spring housing for draft rigging for steam and electric roads. He has combined in two parts four-fold spring resistance, each way, and this can be increased to an indefinite extent without an increase in the number of parts except the springs. The principle is equally well adapted to car trucks for electric railways or steam roads. The M. C. B. coupler requires 59 conditions to apply, while the Van Dorn has only 10 conditions, and gives unlimited spring resistance in addition. Every claim set forth in the patent was fully allowed.

## OWNERS OF STREET RAILWAY STOCKS.

The stock in the three large street railways in this city is held, not by a few millionaires as many suppose, but is divided among nearly 3,000 stockholders, of whom a very considerable number are widows and wards. A recent resume of the stock records of the companies resulted in the tabulation of the following figures:

### West Chicago Street Railroad:

Owners of 1 share.....	103
Owners of 2 to 5 shares.....	532
Owners of 6 to 10 shares.....	245
Owners of 10 to 50 shares.....	435
Owners of 50 to 100 shares.....	234
Owners of 101 to 1,000 shares.....	177
Owners of more than 1,000 shares.....	18

Total stockholders.....1,744

### Chicago City Railway:

Owners of one share.....	22
Owners of two to five shares.....	82
Owners of five to ten shares.....	62
Owners of 10 to 50 shares.....	222
Owners of 50 to 100 shares.....	65
Owners of 100 to 500 shares.....	140
Owners of 500 to 1,000 shares.....	31
Owners of 1,000 shares and over.....	24

Total shareholders.....648  
Number of women stockholders.....245

### North Chicago Street Railroad:

Owners of 1 share.....	18
Owners of 2 to 5 shares.....	88
Owners of 6 to 10 shares.....	60
Owners of 10 to 50 shares.....	195
Owners of 50 to 100 shares.....	68
Owners of 100 to 1,000 shares.....	106
Owners of more than 1,000 shares.....	7

Total stockholders.....542

## THE LONDON UNDERGROUND STEAM ROADS.

For nearly 30 years the steam locomotives have been used to operate the cars on two underground railways of London. These tunnels have been poorly ventilated, which has been a source of trouble for many years. The traffic has constantly increased, and last year 136,680,884 passengers were carried. Very large sums of money have been spent in the construction and equipment of these roads. The Metropolitan Railway is  $69\frac{1}{4}$  miles and the Metropolitan District Railway is  $14\frac{1}{4}$  miles long, the cost of the two aggregating \$100,000,000. Last year Parliament appointed a committee to investigate the question of a suitable traction system. The first conclusion of the committee was that electric traction should be adopted. It seems rather singular that the management should state that: "The moment we can get a reliable firm or combination to undertake the working by electricity we shall accept it," and "The question to be solved was having a sufficient reserve of energy in the event of two, three, four or more trains wanting to start at the same time for them to do so. That was a problem exciting the minds of electricians." Perhaps these are questions taxing the capacities of the companies and electricians of England, but they simply provoke a smile with designers

and manufacturers of American apparatus. Yet there is objection to employing American engineers to make the much-needed alteration with American apparatus.

## CAR BARN DESTROYED BY FIRE.

During the blizzard of February 20 the car barn of the Menominee (Mich.) Electric Light, Railway & Power Company caught fire and was entirely destroyed. There were eight motor cars, five trailers and repair wagons in the barn at the time; of these only three cars in a badly damaged condition were rescued. The fire was attributed to a live wire in the barn. The loss is estimated at \$30,000, with insurance of \$1,500 on the building and \$19,000 on the cars. Superintendent Daniel telegraphed orders for new cars to be delivered April 1, and asked for spare cars from the railway companies of Marinette, Janesville and Escanaba.

## SCORES THE VESTIBULE.

The Salem (Mass.) "Observer" says: A terrible accident occurred on the New People's Line of electric cars at West Newbury on Monday, during the storm, which demonstrated most terribly the danger which street car people have urged against the vestibuled car, the liability of collision. It was by far the worst electric car accident in the history of Essex county and it is a source of satisfaction, that there were only a few people in each of the colliding cars for had they been heavily laden the loss of life must have been terrible. As it was one of the motormen had his leg cut off and the conductor was thrown down and his leg broken. The accident occurred at the foot of the famous Pikestave hill. The cars were off the regular time and the motormen did not discover each other's cars, until they were so close together that their momentum could not be arrested.

## EXHIBITS AT ILLINOIS STATE MEETING.

On the invitation of the members of the executive committee of the Illinois Street Railway Association, a meeting was held in the Tremont house on February 19 to discuss the question of an exhibit at the coming state association convention. A committee of supply men was appointed with W. J. Cooke chairman, to canvass the matter. This committee did so and met at the office of the Wells-French Car Company on February 24, where it was found nearly all the proposed exhibitors had already promised other exhibits at the same date as the Illinois meeting and therefore it became impossible to make a display at the state meeting. It was unanimously voted to recommend to the executive committee the change of a few days in the date, so as to bring that convention to the date set for the convention of the National Electric Light Association, which convenes in this city on June 7, 8 and 9, in which event the supply men could make a joint railway and lighting display. Inasmuch as the two meetings are only a few days apart and many delegates will want to attend both, it would seem altogether the wiser plan to change the Illinois date to conform to that of the Electric Light Association, each association meeting separately but with the exhibits all being under one roof.

President Patterson is strongly in favor of the plan and as soon as he can get a meeting of his committee, it is expected the proposed scheme will be adopted.





Interesting Bits of Information from all Parts of the Country,  
Boiled Down for Busy Readers.

The street railways of Chicago have applied to the city council for franchises on some 12 miles of streets.

During the winter time the Twin City Rapid Transit Company of St. Paul runs a sand car over its lines each night and sands the rails, an extra supply being given to the track at grades.

A head-end collision between trolley cars of the Lowell & Suburban Street Railway Company occurred in North Chelmsford, Mass., in which several persons were severely injured and the cars badly damaged.

A motor car of the Evansville (Ind.) Street Railway Company was struck by a passenger engine of the Eastern Illinois Railroad, the conductor being killed and the motorman and one passenger seriously injured.

The Plainfield (N. J.) Street Railway Company has put in a new equipment of motors one on each truck and these have given good satisfaction. Not one burn-out has resulted from the snow and water since the new motors were put on the cars.

An open switch at 31st street and Center avenue, Chicago, which the motorman failed to notice in time to stop, permitted a trolley car to leave the track and take a run over the pavement. A pedestrian standing near the track, waiting for the car to pass, was run over and badly injured.

An attempt was made to hold up a car of the St. Joseph Railway, Light, Heat & Power Company but the prompt action of the conductor put the highwayman to rout. The conductor drew his revolver when threatened and the robber took refuge behind a trolley pole until the car was out of range.

The statement of the Metropolitan Street Railway, New York, for the last quarter of 1897, shows an increase in the number of passengers carried of 2,214,000; in two years the increase has been 10,906,740. The earnings on the stock for the quarter were 1.785 per cent as against 1.36 per cent in 1896, and 1.19 per cent in 1895.

The report of the Toronto Railway Company gives the net profits for 1897 as \$332,022; of this dividends of 3½ per cent on the capital stock took \$210,000, and paving charges \$60,000. During the year 10 closed and 20 open motor cars were built in the company's shops, and 31 metal trucks and 50 motor equipments were added.

The board of directors of the Worcester (Mass.) & Suburban Railway Company decided to issue no more pass-books as they have been a constant source of trouble. No one will be entitled to ride free on the cars except employes in uniform. Even the officers and directors will be compelled to pay the full fare on the cars.

An ordinance has been introduced in the Oakland (Cal.) city council providing that each street car in the city shall have a crew of two men, each of whom shall not be less than 21 years of age. Some of the conductors employed by the street railway companies are mere boys and this ordinance is designed to put a stop to this custom.

The breaking of an intermediate gear in the cable plant of the Ninth street line, Kansas City, on February 21, tied up that line for 23 hours. A similar accident also occurred a week later in the plant at St. Paul. This accident was caused by a loose nut falling into the mesh, breaking out the teeth in blocks of five. Such accidents are quite rare.

Some miscreant piled stones on the track of Hagerstown (Md.) Railway Company, evidently for the purpose of wrecking the car. The motorman discovered the stones in time and removed them. Later in the evening the conductor was struck in the face by a stone. This was likely done by a passenger who was ejected by the conductor a short time before.

A verdict of \$10.10 was given to G. W. Carr against the Toledo Traction Company because he was compelled to pay an extra fare for an improperly punched transfer and a transfer was refused him on another line for the reason that he had not asked for it at the time he paid his fare. The case was immediately appealed and will be sharply contested by the company.

The Macon (Ga.) Consolidated Street Railroad Company has made a change in the length of the working days of its conductors and motormen. Formerly their services have been required from 12 to 18 hours a day, but now nine hours is a day's work with a maximum of 12 hours. By this change a large number of extra men have been given permanent employment.

During the rush hours in the morning and evening the trolley service on Brooklyn bridge has been found inadequate. A 15-second, and in some cases a 12-second, schedule is maintained but so great are the crowds, especially in the evenings, that it is like a Fourth of July jam at a pleasure resort. The cars from the seven lines now using the bridge number 2,050 per day but later on the cars from 15 lines will run over the bridge.

A bill has been introduced in the New York assembly compelling the street railway companies of New York city to provide two conductors to each car between the hours of 6 and 9 a. m., noon and 2 p. m., and between 4 and 8 p. m. Another bill provides that all the cars in the city, running less than the entire length of the line, shall have a sign showing their final destination.

The village board of Oak Park, a suburb of Chicago, insists upon the observance of an old ordinance which provides that the Chicago, Harlem & Batavia Railway shall furnish gates or flagmen at all street crossings in the village. This line is operated by the Suburban Railroad Company, and to comply with the law each car stops on the near side of every cross street, while the conductor walks leisurely ahead with a red flag.

Sir Frederick Bramwell is quoted as saying: "Another reason why electric traction has not made more headway in this country (England) as compared with America, is that in the United States they have not, as we have, legislation which checked private industry and would compel the proprietors to sell their property after a certain number of years at the price of old iron."

The Barney & Smith Car Company, of Dayton, O., has commenced a suit for \$19,000 against the Syracuse Rapid Transit Company for cars built by the former company. W. W. Hazzard purchased the cars and gave securities for \$19,000. The car company claims that the railway company is liable, Mr. Hazzard acting as its agent, but this is denied and payment refused by the transit company.

The statement of the earnings of the Brooklyn Rapid Transit Company indicates a decided improvement in traffic over the last two years. For the month of February the earnings were \$385,967, which is more than \$25,000 above the incomes of either 1896 or 1897 for the corresponding month. For the eight months preceding March 1 the earnings were \$3,607,823, a large increase over preceding years.

There is a city ordinance in Indianapolis that all street cars shall be heated when the temperature is less than 20° above zero. A passenger noticed that there was no heat turned on one morning when the temperature stood at 19° above and complained to the police court. J. M. Elliot, superintendent of the Citizens' Street Railway Company, was fined \$5 for the violation, but an appeal to the circuit court was taken.

Messrs. Bundy & Thompson, formerly room clerks at the Hotel Hollenden, Cleveland, have entered the field on their own account, and are now the proprietors of the "Stillman," which is centrally located on the famous Euclid avenue, and is absolutely fire proof. They are very popular young men with a wide acquaintance among the street railway men, who will find the Stillman a good place to make headquarters when visiting in Cleveland.

A peddler, while driving along the track of the Consolidated Street Railway Company, of Grand Rapids, Mich., fell asleep on his seat, it being late at night. There soon followed a head-end collision with a trolley car, which could not be stopped in time. The force of the blow threw the man through the front window into the vestibule of the car with hardly a scratch. The only unfortunate result of the accident was that the horse was killed.

A motor car of the Chicago City Railway Company was struck by four wild freight cars loaded with stock while crossing the Grand Trunk Railroad. The car was thrown violently on its side, killing the motorman and rendering unconscious two of the passengers. The grade crossing was guarded by gates and a flagman, and the conductor preceded the car but they failed to notice the detached freight cars which were coming swiftly and silently to the crossing.

The Capital Traction Company, of Washington, has started its cars on the electric conduit system which has

just been finished along the 14th street line, which are now running as far as the Treasury building. The current is supplied from the power station of the Potomac Electric Company and the whole system is working with perfect satisfaction. The cars will not be put in operation on the Pennsylvania avenue line before the power station of the traction company is completed.

The Boston Elevated Railway Company has invited competitive designs for a standard passenger station and a prize of \$1,000 is to be given for the successful plan. The intention is to get a structure which combines strength and security with architectural beauty. W. E. Baker, general manager of the Metropolitan West Side Elevated Railway Company, of Chicago, and W. T. Groundie, of the Kings County Elevated Railroad, has been called in for consultation. All plans will be submitted for the approval of Mayor Quincy.

The Michigan Manufacturing Company, Ypsilanti, Mich., is meeting with much success with the Sweet rail drill, manufactured by it. This drill, which was illustrated in the REVIEW, July, 1897, can be adjusted to or removed from the work in three seconds; it is simple in construction and can be operated by the cheapest labor. The drills are made for either T or girder rails, and there are special designs for structural work. The weight is about 150 lbs., and when it is desired to move it, it is turned upside down, and the balance wheels serve as a truck.

Arrangements have been completed between the Cleveland, Painesville & Eastern Railroad Company and the postal authorities to operate a mail car over the lines of the company. A new car will be built at once according to the specifications of the post office department. The car will leave Painesville going west daily at 6:30 a. m. and 2:30 p. m., and will leave Cleveland at 8:30 a. m. and 1:30 p. m. A mail clerk will be in charge of the car and distributions will be made along the route which will be a great boon to the residents of the suburban towns.

The motormen on some of the Brooklyn trolley lines took a unique method of protecting their faces from the wind and snow during the recent blizzard. One man, whose face had been blistered by the driving snow and the cold bought a false face at a toy shop and tucked it in between his fur cap and collar. The efficacy of this idea was recognized by his fellow employes, who were likewise exposed, and they adopted the same plan for protection. To those who were on the streets at the time of the storm it was a fantastic sight to see the grotesque faces peering out from the front platforms of the cars.

By a strange irony of fate the claim agent of one of the roads in Kansas City was badly injured by one of his own company's cars. At last accounts he was spending the forenoon in presenting the merits of his case to himself and trying to work on his own sympathies for a liberal allowance for these well nigh mortal injuries; and the afternoon in the endeavor to make himself believe he was out of town at the time the trouble occurred; meanwhile, being his own attorney, he has to lie awake nights for fear he will settle with the company on the quiet, and lose his fees for having handled the case and secured the settlement.





The International convention of the gas, electric light and street railway men, comprising the Texas Street Railway Association, the Texas Gas & Electric Light Association, and delegates from Mexico, was held in Laredo, Texas, March 9-11, inclusive. There were a number of causes which combined to make it impossible for many of the street railways of the state to be represented, and the plan, originally outlined, of having separate meetings of the two associations was abandoned, and the papers by street railway men were read before the joint sessions.

The convention was called to order at 9 a. m., Wednesday, March 9, and L. J. Christen, mayor of Laredo, delivered the address of welcome, as follows:

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**Address of Welcome.**

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The city of Laredo bids me greet the stranger within our gate, not as a foreigner, but as a guest and friend, for whom nothing that we have is too good; and never was a behest more gratefully obeyed. When I say "welcome," I would wish you to understand it in that generous hospitality that it bears in our own south-land. We shall endeavor to bear substantial testimony to the fact that we are not unmindful of the compliment and honor bestowed upon us in the selection of our city for your convention. These words, my friends, are not addressed to you as lip tricks, and in no spirit of time-serving or apology.

The marvels of your electric currents outrival all the magic of necromancer and alchemist. You are compelling nature to reveal the secrets which she has so artfully concealed. Your science is the magnet of our times. It woos the thinker and the worker alike; it opens careers and pays rewards of dazzling brilliancy. Ever since Edison has made our life almost automatic and your science so alluring, devotees have been flocking to it by the thousands.

The marvelous triumphs of electricity have been as beneficent as they are great. You have in myriads of ways ministered to our comfort. You are the benefactors of our race and the civilized world is gazing with amazement upon the wonders of your inventions.

My friends, I shall not trespass further upon your attention. You have heard that Mr. Lincoln, when called upon by

a body of clergymen to suggest certain measures during the war, said to them that "most words he listened to in life generally reminded him of something, but what they had said did not remind him of anything." But the scientific men that I see before me today remind me of something, indeed; and I had begun the preparation of an elaborate address to tell you of the great things of which you reminded me, but the atmosphere became so suddenly charged with electricity by your arrival that Mr. Yeager's wires became crossed and we were enveloped in utter darkness; and as I am constitutionally opposed to working by lamp-light, I resolved to cut my speech short and to confine myself to wishing you, one and all, a most hearty welcome.

President Drake, of the Texas Street Railway Association, responded in a happy speech thanking the mayor and the citizens of Laredo, and concluded by introducing Antonio de la Fuente, one of the delegates from Mexico, who addressed the convention. The following is a translation of his remarks:

Ladies and Gentlemen: The bonds that bring all countries into nearer and more friendly relations are those of fraternity. The light that shines the brightest over the path of progress is that of intelligence, and the shorest road to prosperity is that of honest labor. Today, one of the cities of our sister republic opens with creditable pomp the doors of one of its temples built to honor the fruits of labor and intelligence, to receive us as brothers and make us participate in the admiration of the latest achievements of science.

It affords me a real pleasure to comply with the honorable commission vested in me by the Mexican delegates, to express our sincere appreciation of the words of kindness we received in reaching the land of the immortal Washington from the distinguished mayor of this city. At the same time I receive no less satisfaction in expressing that we feel grateful to the initiators of this valuable meeting of intelligence, to which meeting the Mexican delegates attend possessed of the deepest feelings of admiration, respect and friendship; I say admiration because such is due to all which is wonderful; respect, for such is the tribute we owe to the conquests of knowledge, and friendship, because the bonds of fraternity which unite our countries are daily growing stronger. It is this principle of union that we must guard, and every citizen of the two great republics must concur in the task of

preserving it, with as much fidelity as we preserve the memory of our great ancestors.

L. T. Fuller, president of the Texas Gas & Electric Light Association, responded to the address of Senor Fuente, as follows:

It is with pleasure we greet you at this, the fourth annual meeting of our association, and we assure you we feel highly honored by your presence among us, and hope that your visit will be a pleasure to you and that you may profit by this meeting and find something that may be useful to you. We must, nevertheless, remind you that ours is a young association, but our members you will find are among the principal gas and electric light plants of our state, and some among us represent the great industries of the United States, you will also find that a great many of our principal manufacturing industries are represented in the display and exhibit

### Associate Work.

BY CARL F. DRAKE, AUSTIN.

The Good Book teaches us that God created man after His own image. If He had also given us those other attributes that go to make up a perfect creature, we should have but little reason to discuss the question of associate work, or to consider the evils as well as the benefits that arise from a concert of action amongst those whose interests harmonize.

Associate work is as old as history—yes, even older than written history; and so far as modern times are concerned, when the first bright rays of civilization cast their glinting beams on the dark ages of barbarism; when the semi-barbarous tribes of Europe began to feel the warmth of the new and better life, associate work was found necessary. First the traders and the crude artisans joined together for mutual protection as against the neighboring tribes; then the masses organized to protect themselves against the more powerful owners of the land; then certain classes of mechanics and artisans associated themselves together



MAYOR CHRISTEN.



PRESIDENT DRAKE.



PRESIDENT FULLER.

which you will be shown; the papers that will be read in your hearing we hope may be of interest to you, and that it will be a pleasure to have you enter into the discussion of them; and we desire to have the pleasure of numbering you among our membership at this the beginning of our first international association meeting and hope it will redound to our mutual interest, and that you will lend your aid and kindly preferred endeavors in building up an association that we may all feel proud of in the future.

At the first inception of this international meeting it was unanimously agreed by our executive committees to invite you, and again I assure you, we feel by your presence that we have been honored, and we thank your consul, Senor Ornelas, at San Antonio, and the minister of foreign affairs of the Republic of Mexico, for the kindness shown and interest taken in aiding us in bringing about this meeting, and we also have to thank the seniors in the several states that have so courteously aided us, and have to regret that the time was so short that some of them could not accept the invitation and be present with us.

Now, gentlemen, as the mayor of the city has so kindly tendered to you and us the hospitalities of the city of Laredo, we now turn you over to the members and our ladies and the several committees, and hope you will feel at home among us.

to protect some trade secret or particular style of workmanship. These latter organizations—guilds as they were called—soon spread over Europe and, particularly in the northern countries, became important factors of government. And so on down—the laboring classes, the commercial elements, and the very government itself has found the corner stone on which to erect the structure of success in associate work. And so long as organized labor has been confined to the honorable upbuilding of trade, commerce or good government, so long has associate work been most valuable; and if it had been confined to these channels there would have been but little use for us to discuss the advantages and benefits to be derived from associate work. But, unfortunately, like many other of the choicest gifts to man, the power that comes from a concert of action has so often been abused that even the most innocent organization, formed as ours is, not for gain or to foster the interests of any man or class of men, but rather as an educational institute, is looked upon with suspicion, and its actions closely watched by every shyster politician who hopes by this means to further some personal interest, even at the cost of the betterment of our people. This, my friends, is not confined to our own country, but wherever the touch of liberty has opened the gates to discussion.

Now, for a moment let us consider the reasons why we must defend as well as advocate associate work. As far back as the ninth century we find associate work in the feudal system, which is the foundation of our present form of government. Associate work was necessary for protection and development, but as the lord grew strong and waxed rich from the labors of his vassals, the old Adam developed and caused him to take advantage of his stronger organization to overthrow his neighbor, and thus the



story of evil results from the purest and best inceptions. And from that day the same unfortunate principles, or, rather, the lack of principles, have caused man to pervert those good things for pernicious and unlawful purposes. Such is the history of man's ambition, and often of his downfall.

Early in the sixties trades unions sprang up in England, fostered and encouraged by the government, and were doubtless of much benefit to the laboring classes, but, unfortunately, as they grew stronger there was but a repetition of history. Their power became such an important factor in the commerce that it was found necessary for the government to appoint a commission to examine into the modus operandi of the trades unions. This resulted in the enactment of laws in '69, '71 and '75, defining their rights and prescribing the limits to which they might combine, and how far their acts were lawful. Germany, France and Italy have also found it necessary to deal with these questions with more or less severe measures.

Of the darker side of associate work in our own country, about the first combination that proved a menace to society and threatened our commercial interests was that horrible organization formed amongst the coal miners of Pennsylvania, known as the "Molly McGuires". Horrible in its inception, dangerous from its birth, it took most severe measures to suppress it; and did more harm to labor and kindred peaceful organizations than can be eradicated by a thousand useful deeds. Perhaps the next most dangerous was that created by one Debs, who boasted but a year or two ago that at his word a million men would lay down their tools, and so hamper the wheels of commerce that the world of business must accede to his most outrageous demands; and while scarcely 5,000 answered his call, yet a trail of blood was left behind, and many widows and helpless children even today cry aloud against a crime perpetrated under the name of peaceful organization. But enough of this; we have endeavored to illustrate the evils that may arise from the vicious use of a most worthy method, where the greed for power or the hope of gain may cause trouble and disaster when placed in the hands of the avaricious or the ignorant.

Now let us look at the other side of associate work, and the advantages that may be derived from a proper use of its powers. The very foundation and corner stone of every Christian and civilized government is based upon organized efforts, and no nation exists to-day that cannot trace its origin and progress to associate work, and if we but had the time to compare the growth of the recognized nations of the world we would find that the ratio of united action measures the amount of development attained. The two grandest examples of the present age, the United States and her sister Republic of Mexico, are lessons of associate work that will live so long as history shall live. Divided as we are into municipalities and states, for the better management of local affairs, we are each a grand association for the purpose of better government, furnishing a larger field for development and better protection of our citizens. In our own country, the Brotherhood of Locomotive Engineers and the Knights of Labor, as operated under the guiding hand of Mr. Powderly, together with the hundreds of commercial clubs and kindred organizations, all bear witness to the wisdom of and the benefits to be derived from associate work. Associate work has, by its fostering care, given to us the greatest gems of art; by its support and encouragement developed for our use the best thoughts of man. It has builded well of church and school; it has been the best friend of the scientist; it has brought together the greatest minds of the world; and by an interchange of experience and the introduction of new thoughts has given to us the wonderful development and advancement of the nineteenth century. Individual minds must, of a necessity, if much work is accomplished, work in a single channel; and the collection of these ideas by association is what gives the world the best and greatest results. They formulate and prepare; then, by the aid of associated capital, theories become facts. What individual would have linked the Atlantic to the Pacific with an iron bond that makes orient and the occident almost one? What single person had the power to wrest from savage hands the broad plains of our beloved nation and offer them up to the sturdy frontiersman? Who, without associate work, could have turned these wild lands to the richest gardens, with a wealth of products that feed and clothe the world? Who would have dared to link all nations together with a wire, each moment pulsating with the news from all the world? And

so on we might at length illustrate the advantage of working together. Yes, my friends, we live in an age when man must realize that he is but an atom in the march of progress; we must realize that no matter how stalwart we may be we cannot combat with the wave of associate work.

We meet here to-day as the representatives of two organizations, whose members have taken up for their life work the study of that wonderful power, the effects of which we know so much, but of its origin and the limitation of its power so little—a power that we have chained by but a slender thread. We know that it is all powerful, but from whence it comes or what its limits are, we know not; we still grope in the darkness of theory, with but a limited application. These gentlemen who have made particular branches of the work their study, come to tell you of the knowledge that they have gained, to interchange their varied experiences, realizing that by association each may help the other to a better understanding, so that we may all be more useful and successful workers. Who can for a moment question great benefits of a concert of action? Who can say in honesty that the benefits do not far exceed the evils that arise from men forming themselves into organized bodies? Why, the very organizations such as we represent are necessary to hold in check and to overcome



JARVIS PLAZA.

the evil effects of man's greed. Civilization, church, state, science, the arts—all demand the best efforts of man, and man singly cannot combat with the demands of the progressive age in which we live; therefore, the peculiar necessity for combined effort. So let us active workers upon whose shoulders rests the responsibility of writing the last pages in the great book of the nineteenth century so unite our efforts that our children and our children's children, when our life's work is over and they are called to add their chapter to the history of the new century, may look back upon us and our work with pride and satisfaction that can only come from gleanings the best thoughts, separating the chaff from the wheat, and in the great mill of associate work bringing forth the richest proceeds garnered from the experiences of a century that will then be dead.

The meeting then adjourned till 2 p. m., when the officers and committees made their reports, and the convention proceeded with papers. The papers read by the delegates from the street railways will be found at the conclusion of the report of the convention. The papers read by the gas and electric light men included:

"Meter vs. Flat Rates," by J. R. Cullinane, Denison.

"Uniform Voltage and Continuous Service," by George R. Cushman, San Antonio.

"Street Mains and Services," by J. H. Fitzgerald, Houston.

"The Ups and Downs of the Manager," by J. D. Olinger, Cleburne.

"Instantaneous Water Heaters," by Thomas D. Miller, Dallas.

"Experiments in Efficiencies," by E. E. Gibbon, Corpus Christi.

"An Electric Furnace," by J. D. Cox, Galveston.

"Rates for Electric Lighting," by E. L. Wells, Jr., Marshall.

"Miscellaneous Matters," by W. L. Hall, Mexico.

On Friday morning it was decided to consolidate the two associations, and the new one will be known as the Southwestern Light and Street Railway Association. Officers of the new association were elected as follows: President, Carl F. Drake, Austin; secretary, E. L. Wells, Marshall; treasurer, Fred Frier, San Antonio.

The delegates were handsomely entertained by the local committees, and the citizens of Laredo during the intervals



CONVENTION HALL.

between the meetings of the conventions. Among the excursions was one to coal mining regions, 28 miles from Laredo.

After the adjournment on Friday evening the delegates left on a special train over the Mexican National Railroad for Monterey, Mexico, where they spent Sunday. The gold and silver mines and "El Toro" were the attractions at Monterey.

Among the exhibitors were the Waco Electrical Supply & Plumbing Company, Waco, Tex.; the Electric Appliance Company, Chicago; the Western Electrical Supply Company, St. Louis; the General Electric Company, Dallas, Tex.; the Central Electric Company, Chicago.

### Trucks and Their Maintenance.

BY GEORGE D. HARTSON, DALLAS.

The truck bears about the same relation to the equipment of a car as the management does to the road; it receives the blows, shocks and strains from the hard conditions in which it may be placed and delivers them softened and equalized to the traveling public in the form of comfort and pleasure. It is the court where justice is turned to mercy.

The first or incipient attempts at trucks were simply pedestal boxes fastened to the car body to furnish bearings for the axles, but now they are built to support and strengthen the car sills and protect the car and its load from the blows, jars and strains of severe service. Much work and cost of maintenance can be saved by a careful selection when getting equipment.

The first quality to look for is strength—ability of the parts to hold up and last. They should be braced so strong that they will stay in line and hold the wheels in line both on straight track and in going around curves. It is almost certain that sharp flanges and double treads are caused by the trucks allowing the wheels to get out of line.

The second is simplicity. A solid side bar is better than one built up of pieces bolted or riveted together, for it is almost needless to remind you that every bolt, nut, rivet or joint calls for inspection and attention, or it will be only a matter of time when they will work loose and repairs, if not worse, will be necessary. The fewer pieces, the less attention will be required.

The third point is convenience. Some trucks seem designed so that you can only get at the renewable parts in your mind and hardly with tools. To bang a motor, it is necessary to take off the car body, and to replace a pair of worn-out wheels will take all hands half a day, and to renew a brake shoe the car has to go over the pit. Motors must be inspected and overhauled, wheels will wear out and must be changed, and brake shoes must be renewed; and speaking of brake shoes—when will the truck maker win the lasting gratitude of the motorman and shopman by arranging an adjustable brake spring to let out as the shoe wears thin? Many a broken brake spring and many a cracked rib have been the results of the usual "once for all" spring in common use. The spring should have an adjustment of at least  $1\frac{1}{2}$  in. to allow for wear of the brake shoe and wheel.

The fourth quality, and an important one, is its riding quality. Some trucks ride easily at no load or light load, and others ride easily only when the car is loaded. A happy combination is one not too stiff when light and not "hard down" when loaded. The springs of a truck should have a short memory, a pitch hole in the track should not be repeated over and over again by the springs after the rough place has been passed. From common practice it appears necessary to have both coil and leaf springs.

The area of brake shoe surface should be sufficient to stop the car, but not enough to cause the wheel to slide. Many patterns of shoes could be shortened with safety in running and longer life to the car wheel.

The lubrication of the axle is better accomplished by oil and wick feed than by heavy grease. Who has tried roller bearings and gained experience from their use?

In closing, I will suggest a question: Why can there not be a standard axle—standard in length, at least, if it is impossible to be standard in diameter?

### Car Bodies; Their Maintenance and Repair.

BY FRANK E. SCOVILL, AUSTIN.

The maintenance and repair of car bodies being an important item of expense in the operation of a street railway system, the executive committee selected it as one of the subjects to be discussed at this meeting, and having assigned it to me I shall endeavor to present it in as brief a manner as possible.

The cost of maintenance and repairs of car bodies is on the same basis as that of any other part of the equipment, a great deal depending on the original purchaser and the honesty of the builder.

To maintain car bodies properly every system should have at least one extra body to every five cars in service in order to be able to spare one or more at any time for repairs. They should be frequently examined and great care should be taken to prevent the bodies getting loose in the joints or otherwise seriously injured before having proper attention, as in that case the expense of repairs will be much greater and the life of the car be very much reduced.

Car bodies that are used in this climate must of necessity have more attention and greater care than those used in most other parts of the country, owing to the long and continued hot seasons. The hot sun of this climate is exceedingly hard on wood work and paints. Continued drought, often lasting five or six months at a time, causes joints to open and paint to crack and peel, and in many sections of our state the alkali or lime dust is very destructive to the interior finish of the car, and experience has taught us that plush or cloth cushions are in all cases to be avoided.



FRANK E. SCOVILL.

It is our belief that the only way that car bodies can be prop-



Frank E. Scovill was born in the Town of Canaan, Litchfield county, Conn., June 14, 1862. At the age of 15 he entered the employ of the Western Union Telegraph Company as a messenger. In 1880 he became connected with the telephone business, first with the Thomson-Houston Electric Company at New Britain, and later with the same company at Lynn. In 1888 Mr. Scovill's health failed and he was advised to go west; he went to St. Paul, Minn., and became manager of one of the Erie Telephone & Telegraph Company's exchanges. Shortly afterwards he went with a lighting company and remained in the northwest with the Western Electric Company and the General Electric Company until 1894, when he was offered a position with the city of Austin, Tex., to supervise the construction of its plant. This contract for electrical construction and machinery amounted to over \$164,000, and Mr. Scovill saw that this was completed without any "extras" whatsoever. After this work was completed he remained as electrical engineer for the city until March, 1896, when he resigned to become secretary and superintendent of the Austin Rapid Transit Company.

erly and economically maintained is to put them first in as good and strong condition as it is possible to do, using only the very best grades of materials, including paints and varnishes, and to employ for this work only thoroughly competent workmen. Cheap labor is always dear at any price. To paint a car properly is an art in itself, and requires judgment and experience. A few cents added to the cost of material or to a day's labor may give the car an extra year of service.

All car bodies should go into the shop once each month and have the bolts and screws tightened up, and at least twice each year all marred and grazed spots should be touched up with paint and the body be given two coats of good varnish. This will preserve the paint, and the car will look nearly as well as when it first came from the repair shop. In this way car bodies can be kept in good condition for four or five years even in a climate like this. Owing to the small rail, low joints, bad track and generally faulty construction, which is the rule rather than the exception in the cities in this state, it is especially necessary that extraordinary care and diligence should be used in the repair and maintenance of our bodies.

When first appointed superintendent of the Austin Rapid Transit Railway I found the cars in a very dilapidated condition. Five of them were closed, and the others were open cars rebuilt and partially closed. We have rebuilt the closed cars after a style peculiarly our own, and which we find excellently adapted to the conditions that surround the operation of our property, but which might not be as satisfactory for others whose necessities are not identical with ours. We at Austin are fortunate in having streets that are wide enough to accommodate the travel of a much larger city, and the few extra inches taken up by the steps of this style of car are not noticed more than with open cars. The balance of the old cars were turned into animal cages at the park and sleeping rooms for our men.

When our road was rebuilt for electric service pine ties and light rails were used and after five years' service you all know the result, the car bodies telling the tale. The consequence was that at that time the whole system was like the wonderful "one-horse shay," going to pieces all at once. Our people were made to realize the necessity of doing something, so we began, a little at a time, and now we are in a fair way to have a good roadbed and to be able to keep up our rolling stock at much less expense than before, we having used over 18,000 cedar ties in the past two years.

You will notice in the illustration of one of the cars rebuilt, that we run a new sill under the entire length of the car, platforms and all. This had to be done on the first three in order to hold them together, and this sill has an iron plate 5-8 by 3-1/2 in. bolted on the outside of the entire length of the sill, thus making a strong support for the lookout platforms. The first ones of this style have been in service for over a year and a half, averaging 140 miles per day over the poorest piece of our track. To operate these cars we use a single G. E. 800 motor equipment, and the cars today show no signs of breaking away at any point. We purchased several light closed second hand bodies late in 1896. We ran them through the winter, then decided to rebuild them after the manner of others that were giving such excellent satisfaction, and today our closed bodies, excepting two purchased in December last, are after this style. The cost of this work, including material labor and supplies, besides adding many improvements, was a trifle over \$200 per car, and the first cost of these bodies to us delivered in Austin was not that much. We

consider that we have a good and reasonably cheap lot of car bodies.

You will notice that our steps are the same as the running board on open cars. This will accommodate about as many passengers to and from our parks and in crowds as an open motor would, and remembering that we take power on a meter basis we do not care to haul trailers more than is absolutely necessary to accommodate the travel. Some of you will ask are you not more liable to accidents by this manner of handling passengers? We answer no, as the facilities for hanging on are just the same as on open cars, and for over two years our claims for damages have been less than \$1,000 and over one-half of this amount was due to a lady falling out of an open car, and the balance was principally for broken vehicles, etc. We operate all closed motors with fare boxes now, and use trailers with conductors when necessary.

It is my belief that by the time our cars now in use are worn out there will be great improvements in the construction of bodies. I believe that steel I-beam construction will be almost exclusively used, reducing the dead weight and adding much strength to the bodies at possibly a smaller first cost and at a greatly reduced maintenance expense.

There has been a disposition in the past on the part of our legislature to somewhat hamper the operation of street railways, and



REBUILT CAR, AUSTIN.

some three or four years ago there was introduced in the legislature of this state a bill to force all systems to operate either open or closed cars during certain months of the year, thus necessitating a double equipment, something no line can afford, and had this measure become a law it would have forced us to materially contract our service, much to the inconvenience of our patrons and at a material loss to ourselves, and we hope that every representative of a street car line in Texas will make it his business to become acquainted with the member of the legislature from his district and so educate him as to our needs and to the great number of evils that now surround us and hamper our growth and development that he will see the necessity of assisting us rather than to add further loads to our already overburdened shoulders. Municipal governments also seem disposed in some cases to adopt a similar course, and we believe as much to the detriment of the people as to themselves.

In conclusion I will state that it was against my wishes to attempt to handle this subject, but I did so at the request of some of the committee who were aware that we had rebuilt our entire equipment. What has been said, is, however, the result of experience and is not theoretical.

The success attained in rebuilding and general overhauling the cars and system is in a great measure due to the encouragement

and ready assistance of our receiver whose business policy is, "Adopt a high standard and keep to it," a method so rarely pursued by the managers of street railway lines in the south. It seems to be the idea, with few exceptions, of the heads of most of our southern roads to operate their property with the least possible expense, regardless of the detriment to the machinery and equipment upon which of necessity is based the value of any street railway, and upon which depends so largely the earning capacity and the dividend paying ability of any system.

### Rail Bonding as a Power Saver.

BY H. C. CHASE, HOUSTON.

Rail bonding is a very important part of a properly constructed street railway using an overhead trolley wire for a conductor of current applied from some source containing electrical power and depending upon the rails upon which the cars are run to complete the circuit. It is generally known that rails connected by ordinary fish-plates furnish a very poor conductor for the electrical current, as the rail joints are generally rusty, both expand and contract, invariably work loose and they are not looked after until a bad joint is reported.

I think no well-informed street railway man will contradict me when I assert that the return current on probably a majority of the roads in this country is not as good as it should be, and that an appreciable loss in energy, therefore loss in dollars and cents, results. It is also probably true that a liberal return on the money required to thoroughly re-bond the rail would be realized. In many cases rails which are sufficient in conductivity to carry all the current required by the cars with a very small percentage of loss are imperfectly joined together at the ends electrically, so that a loss as high as 50 to 60 per cent results solely from imperfect or inadequate bonds. Probably there is not a road in this state operating so many cars that its rails are not ample to carry all the return current required with a loss of less than 10 per cent, and if the rails should be properly bonded to obtain such a result a good return on the investment would be insured. Many roads go on erecting heavy copper to carry the out-going or positive current, overlooking the fact that as good or better path is required for the return current. They depend on the ground, water and gas pipes in the vicinity to help out a poorly bonded track. These are very poor and uncertain factors at best, and very poor results are obtained wherever they are depended upon, always entailing losses not only to the street railway company, but also to the owners of the pipes by electrolysis. I believe there are few managers of street railways who realize what their loss on this account amounts to annually, and that many would be surprised if they could have the actual figures placed before them. The losses appear in various ways, principally, of course, in the direct loss due to energy required to overcome the resistance in the track. On many roads with a station voltage of 550 the average over the whole line is not over 400, or a direct loss of 27.8 per cent, while at distant points it may be as low as 350 or 300 volts, a direct loss of 36.3 and 45.4 per cent, respectively. Let us consider what a loss of 15 per cent on the track means to the railway company in dollars and cents. Take a road operating 25 cars daily, and assuming that fuel costs \$1.25 per car per day, or \$31.25 as total cost per day, which will give us \$11,426.05 annually. Now, 15 per cent saved on this amount equals \$1,710.92 annually, or 5 per cent on an investment of \$34,218.75. In addition to the direct loss above referred to in fuel, there are losses due to burning out of the electrical equipment, an item hard to estimate, but it is safe to say that 75 per cent of the burn-outs of armatures and fields on electric cars are due to the insulation on wires becoming overheated and therefore are weakened by being subjected to a current for which they were never intended. A motor wound for 500 volts to develop 26 h. p. requires 37.3 amperes. It will carry that amount of current without injurious effect, but to do the same work with only 300 volts requires 62 amperes, a current for which the motor and fields were never intended, and which they can not stand for any length of time without danger of the resistance becoming injured through excessive heating.

The Houston Electric Street Railway Company is using No. 0 tinned copper wire with 19-32-in. channel pins. Nearly two years



H. C. CHASE.

ago we placed some bare copper and tinned copper No. 0 bonds in our track as an experiment. Before finishing this paper I took pains to look at them. The bare copper wire was nearly eaten through by corrosion. The tinned copper wire was as bright and perfect as the day it was placed in the track. We are using the bonds both alongside and underneath the fish-plates. We find that if special care is taken in drilling the rails inserting wire and channel pins, driving flush to web of rail, there is little chance for moisture to enter. During the month of January we had two or three blocks of double track removed and replaced with 60-lb. steel, operating cars on both sides of reconstruction work. Before the completion of track and bonding our ampere meter indicated 500. After completion of track and thoroughly bonding the same our meter showed an average of 450, reduction of 50 amperes, and a saving of 10 per cent, lessening the load on the generator, consequently reducing the fuel expense. This proved to us what we could do on one line by thoroughly bonding the track.

We have double bonded the track entering both ends of the car shed, also all lines in close proximity to the power station. In addition we run an overhead No. 0000 ground feeder tapping the different lines at equal points and the belt lines on all sides, and we find our fuel bill has been reduced 30 per cent, and the load easy to carry and comparatively free from violent fluctuations. Our Franklin street line runs close to the power house and several lines are connected with it. We double bonded each joint on this line. When we reached San Jacinto street, three blocks from the power house, the ends of the rails commenced to arc, and it is with great difficulty our men could drill the rails and insert the bonds. After the remaining three blocks had been thoroughly bonded the drop in the load at the power station was perceptible at once, showing conclusively the necessity of good ground return. We have had some trouble in keeping our overhead ground feeders connected with the rail. They have been burned off several times at the rail connection. We find the trouble was caused by using too small a contact, and accordingly we increased the contact circuit by attaching the ground feeders to both rails and bond wires, and have had no trouble since this was done.

Rail bonding as a power saver depends upon the following three points which I have endeavored to cover:

First, bonds to be of ample capacity; second, perfect connections; third, large contacts.



## Ties; Their Life and Preservation.

BY D. D. WILLIS, SAN ANTONIO.

The ties used by the street railways of our state are, for the most part, pine, though some few roads have in the past few years tried other woods. When the San Antonio street railway was first built in 1877 a part of the track was put down on sawed cedar ties, 6 in. x 4 in. x 6 ft. When the road was equipped for electric traction in 1890, all pine ties, 7 in. x 6 in. x 6 ft. were put down. In 1897, when a system of sewers was being constructed in our city, some of the old cedar ties of mule car days were dug up, and found to be in a perfect state of preservation, after having been in the ground 20 years. In some of these ties the old spikes were still firmly fastened, and the ties showed the saw marks as plainly as on the day they came from the mill.

In low, moist climates, cypress ties last fully as well as cedar, but in a dry climate they are no better than sap pine. Good, heart pine ties last from five to eight years, while pine ties of young trees, even with some heart, last no better than those of old trees of all sap.

In 1894 our company purchased quite a lot of cypress ties, and put part of them in use without treating; the others were treated with C. A. wood preserver. In 1897 we took out some of both; those that were not treated were in a fair state; some could be put back, and some could not; those that were treated were as good as when first put down.

One reason the life of a tie is longer on a steam than a street railway is that only the centers are surfaced; where a tie is covered with earth in its entirety, it will decay much more rapidly than where only partially covered. There appears to be a great deal of rotten lime in our soil that causes our pine ties to decay very rapidly. In most climates a well seasoned, white oak tie will last well, but here they are very little, if any, better than a sap pine. Bois D'arc and mesquite wood are both said to make fine ties, though I cannot speak, from experience, of either. But the best tie for Texas street railways is the red mountain cedar. I know there are some objections urged against them by some street railway managers, but we have given them



D. D. WILLIS.

a fair trial, and I know they are good. Some say they will split when spiked; this is true to some extent, though the percentage of ties that will split in spiking is very small indeed. Others say they will not hold the spikes after being down a short while, and will permit the rails to spread. This has not been our experience; we have found in the last three years that they hold well, even on sharp curves where the strain is great. The supply is almost unlimited in this state, and the price not much in excess of treated pine, or other ties, and when one considers the cost of labor in renewals, say every six years, the cost of the cedar tie is in the end much cheaper, as I am satisfied that a sound cedar tie, 8 in. x 10 in. x 7 ft. will last from 25 to 30 years.

Our company treated some all heart pine ties with C. A. wood preserver in 1895, put on at 200° F., and I very recently took up some and found them perfect. I am lead to believe from this, that good heart pine may last well if properly treated, though I cannot, from experience, say how long, as I can with cedar, for I have talked with several old residents of our city, who tell me that they know, personally, of cedar posts that have been set 25 years and are still perfect, and while this is not personal experience, still I am satisfied it is true.

To all who are able to obtain them, I would say: buy a good heart, red mountain cedar tie, 8 in. x 10 in. x 7 ft.; use Goldie spikes, and a good roadbed of about 10 in. of gravel, and your track repairs will be light during the years to come.

To those not able to obtain cedar: buy a good, heart, long leaf pine tie, 7 in. x 8 in. x 8 ft.; treat it well with C. A. wood pre-

D. D. Willis was born in Claiborne county, Miss., in 1866; he attended school at Chalmers and Hunt Academy of Port Gibson until he was 18 years of age, and then started to work in the freight offices of the L., N. O. & T. Ry. at Port Gibson, and continued in the transportation service of the road until 1892. In March, 1893, Mr. Willis went to San Antonio to take a position with the San Antonio Street Railway Company; in the following June he was appointed assistant superintendent. In August, 1894, he was made superintendent, and in September was elected secretary, which position he has since held.

server, and with a good roadbed, I am sure you will obtain good results.

There is no economy in putting down cheap ties. The cost of labor alone in renewals will, in 10 years, be more than double the cost of good cedar or treated pine ties. A good roadbed is one of the essential parts of any railway, be it steam or electric, and without good ties, this cannot be obtained.

There are in use quite a number of wood preservers; of their merits I cannot speak, except as to one, and that is the C. A. wood preserver, or carbolinium. This I know to be good. We think so well of it that we use it on all bridge and culvert timber and on all of our poles, or rather those parts of our poles that go into the ground. The only objection we have to it is its cost. There is nothing of which I know that will better preserve ties.

## Crank in the Business.

BY C. L. WAKEFIELD, DALLAS.

Crank in the street railway business, are of two kinds, the positive and negative. I shall not deal with them, however, as to this classification, but simply try to call your attention to the few that I think of that are a curse to our business.

When the Creator stored our fuel products, aeons of years before our time, or before the possibility of our need had arisen, He gave the gas producing matter such nice balancing that the combinations it admits of are as numerous as the sands of the sea; and these combinations offer a stimulus to the desire of discovery implanted in every human mind that has worked great wonders, especially in the last few years.

One of the most poorly paid and least appreciated men in our business is the fireman; and because of this, and of the undesirability of the job, we find firemen independent and cranky; ignorant, as a rule, and unwilling to accept the experience and the result of the deep thought of scientific men who have, for many years, since the discovery of the use of steam, been bending their energies towards the accomplishment of the highest heat result out of a given fuel product. Most firemen have accidental ideas, suggested by the different phases of the moon, or some other abstract and totally illogical authority, for putting coal on a fire, and the general management of the boiler plant. I think that a distinct, determined, combined and unremitting effort should be made towards the bettering of the condition of the fireman, educating him, paying him more wages, surrounding him with what comforts can be given under the circumstances, and getting him interested in the theory, and able to carry out the practice, of the work upon scientific lines.

We next come to the engineer. There are engineers and engineers. We have those who have a certain kind of oil and a certain kind of waste that is the only oil and the only waste they can work with. We have engineers who have made up their minds that certain people who naturally come under their authority are the only people who can do the work; frequently they are relatives and social friends. A great many of our engineers are totally unwilling to try anything new; on the other hand, we have them just as bad in the other direction, in that they are always trying something new, and spending their time, which is the company's money, in experimentation upon paths never heretofore tried.

The dynamo tender: Dynamo tenders as a rule are fairly progressive; their form of crankiness being that they are always patching and never willing to get new parts, or that they always want new parts and are never willing to make use of the old in new shapes and new combinations.

Of the superintendents, I must say that where cranks exist in this business, in my opinion, they are generally those who are forever trying something new; that means, before you get

through with it, an almost entire change in your plant and lines, which latter probability they fail to foresee.

Then I come to the linemen. Linemen frequently get an idea that they own the earth and the heavens above, particularly the latter, and that they have a perfect right to drop wire, insulators, monkey wrenches, and other tools that have a considerable attraction towards the earth, upon the heads of innocent passersby, thus bringing on damage suits that, by our laws, are not only possible of heavy results against the corporation, but are actually stimulative to that end.

Of all the men in the street railway service the ones who probably have the most right to be cranky are the motormen and conductors; and yet I have found these men, as a rule, the most polite and the most careful and attentive to duty, of anyone in the whole service; and this is because more attention is paid to them than to almost any other employe; more arrangements are made for their comfort, and they are advanced wherever advancement is earned and possible under the circumstances. Crankiness in motormen takes the form of disregard of orders and instructions, in starting and stopping the car, in signalling for clearing of track, and in forgetting the time table. In conductors crankiness is found in the way they receive a fare, in their failure to let people off at the right street, and in their personal appearance and the appearance of their cars. It is said that some of them fail occasionally to turn in all the money they collect; but, if so, there is so much method in this madness that it could hardly be called crankiness.

We now come to the secretary or auditor, whose crankiness, if developed, is along the line generally of spending \$10 to save 1 cent.

Finally, next in importance to the fireman, we have the general manager-president, the executive head of the concern, who, too often, has no knowledge, either theoretical or practical, of the business in which he is engaged; and, in a few cases, has not discovered this fact. It is lamentable where only the first condition exists, but where the first and second conditions are found in combination, it leaves the company "poor indeed."

The manager is generally the purchasing agent in small stations, and, too often, does not provide his employes or himself with the means and instruments for properly testing supplies; nor does he arrange for a record of the life and conduct of machines or instruments used on the system.

In conclusion, I beg to apologize for this hastily written article, and congratulate you upon the fact that I have gone out of the street railway business, and it will therefore have one crank less.

### DISTANCE RUN IN QUICK STOP TESTS.

During the trial of a damage case recently in Brooklyn, considerable interest was occasioned by the statements of one of the experts who was called by the plaintiff to testify as to the distance in which a car could be stopped when running at various rates of speed. The expert (?), Stephen C. Crane, testified that in Akron, Ohio, on a road he was connected with there, he had a number of times stopped cars going 10 to 12 miles an hour in from 15 to 18 ft., and going 6 to 8 miles an hour in 10 to 12 ft.; this test being made by reversing the car. Upon the attorney for the defense asking if he was willing to make the test again, and on replying that he was, arrangements were made for it the following morning.

He examined the motor and controllers thoroughly, and said that everything was satisfactory: the car being a 10-bench open car. The spot of ground measured was 200 ft. in length and was practically level, and the time taken over this measured distance was to figure the speed of the car.

The first test that he made he was going between 9 and 10 miles, and when he was about to get to the finish line he reversed the motors. All witnesses on the stand with the exception of himself agreed that he was 30 ft. from the line when he reversed the car, and all agreed that the car went

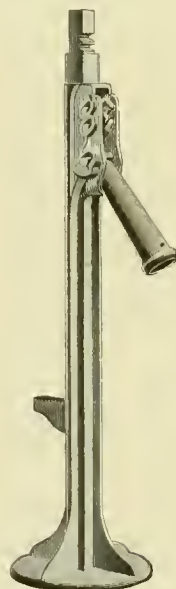
15 ft. from the finish line. The best stop that he made going over 8 miles an hour was 36 ft. He made one stop in 23 ft. 6 in., when he was going 5 to 6 miles, having the controller on two points only.

### MICHIGAN INTERURBANS.

The board of directors of the Mt. Clemens & Lakeside Traction Company was reorganized at the annual meeting. The new board consists of C. H. Lawrence, Alex. Jacobi, E. G. Stevenson, and J. G. Tucker. F. Rouff, president of the company, sold out his interest and resigned, Mathew Slush being advanced from vice-president to the presidency. G. A. Skinner was elected secretary and treasurer. Several of the directors are also interested in the Detroit & Lake St. Clair Railroad, and the Detroit, Lake Shore & Mt. Clemens Railroad, and it is understood that the three roads will be combined. Surveys are in progress for building a line from Mt. Clemens to the head of Lake St. Clair. By April service is promised from Detroit to Marine City.

### THE JOYSE-CRIDLAND JACK.

The Joyse-Cridland Company, Dayton, Ohio, reports a good business for the past year, and all indications point to



a steady continuance and increase. They have recently brought out a jack which will specially interest street railway managers, especially at a time when many are contemplating the annual change of trucks from winter to summer bodies. Its jack No. 220, illustrated herewith, is designed for this special purpose, and where used will not only save enough in time to pay for itself, but will be found a great convenience. Used in pairs, first at one end of a car and then at the other, a car can be raised, without difficulty, clear of its trucks, without blocking, within a space of 10 minutes. The company manufactures a full line of jacks for all railway purposes, and if any of unusual or special design is desired, would be glad to assist managers with any information on the subject which may be wanted

One of the boilers in the Canal street power station, in Allegheny, Pa., gave out and tied up the cars on the Millvale, Etna and Sharpsburg lines, from 7 to 10 a. m., on March 4.

The Pearson Jack Company last November removed the home office from No. 156 Fifth avenue, New York, to No. 64 Federal street, Boston, and since that time it has increased its business remarkably. Its car replacing jack has been favorably received at home and abroad. Chas. G. Eckstein & Co. are the agents in Germany, and Laing, Wharton & Down represent the company in London. Both these firms have placed large orders in their territory, and the future outlook in this direction is very flattering. This company has lately issued a list of recommendations from a number of electric roads in this country, which shows conclusively, that the Pearson car replacing jack has come to stay. If you have not tried these jacks, the company is willing to send you a pair subject to your approval. If you have not seen their list of testimonials, write for a copy to the home office, No. 64 Federal street, Boston.



### COMBINATION OF OHIO ROADS.

At the annual meeting of the directors of the Cincinnati & Miami Valley Traction Company it was decided to lease the property of the Dayton Traction Company for a period of 999 years. The lines of the Dayton Traction Company extend from Dayton, O., to Miamisburg, and the Miami Valley Traction lines run south from Miamisburg to Hamilton. The terms of the lease proposed dividends to the Dayton Traction Company of 2½ per cent for 1898; 3 per cent for 1899; 3½ per cent for 1900 and a like increase until 6 per cent was reached. However a number of the minority stockholders of the Dayton Traction Company brought suit to cancel this contract and have a receiver appointed to operate the road. The directors of the Cincinnati & Miami Valley Traction elected the following officers: President, Judge D. J. Dwyer; secretary, W. P. Schwab, and treasurer, Isaac Silverman.

### NEW NAME FOR A DETROIT COMPANY.

The Fort Wayne & Belle Isle Railway Company was purchased by Tom L. Johnson, R. T. Wilson, Albert Pack and H. A. Everett for \$700,000, at the rate of \$175 per share. The name of the new company will be the Detroit, Fort Wayne & Belle Isle Railway Company, and its capital stock has been increased to \$1,200,000. The new officers are: J. C. Hutchins, president and treasurer, and A. E. Peters, secretary. Officers were chosen for the old organization which will be maintained for the purpose of paying off the bonded debt and closing up its affairs. A. B. du Pont, general manager of the Detroit Citizens' Street Railway Company, will occupy a similar position with the new company. N. W. Goodwin, who has been secretary of the Fort Wayne company for 23 years, has retired from the management and from active business as well.

### A LIVE ROAD.

Although not the largest road in the country the Atlanta Railway is certainly one of the most enterprising and up-to-date of roads.

Foreseeing the almost universal desire for a war with Spain and alert to the opportunity for benefiting his road, the manager of this company, by the judicious use of a number of lurid banners has succeeded in keeping his cars bound to Fort McPherson at all times well filled. Day after day the army post is thronged with excited visitors and the most ordinary drill is construed to be a rapid preparation for war.

It is the ever alert manager who fills his company's coffers and makes himself invaluable.

### ELECTRIC 'BUSES IN LONDON.

According to the following in the "London Electrician," electrical 'buses are not making much headway as transportation lines: "Electricity as a motive power for the 'buses owned by the London General Omnibus Company had very few friends at the meeting of shareholders yesterday, and the chairman, while admitting that the directorate are watching very closely the development of motor vehicles, held out no promise of an early introduction of mechanical power as a means of propelling the omnibuses which now

so nearly fill the London thoroughfares. One shareholder expressed his conviction that the day was very far off when 'buses would be propelled electrically, and to make matters worse, expressed himself as personally very glad this was likely to be the case."

### NEW ILLINOIS INTERURBAN.

Subscription books have been opened for the stock of the LaSalle County Railway Company which proposes to build electric lines in LaSalle, Grundy, Kendall, Will, Cook and Lee counties, Illinois. One of the lines projected is from Streator to Ottawa, 18 miles. The capital stock is \$500,000; the commissioners to receive subscriptions are W. H. Holcomb, of Chicago, and Charles H. Rathbun and W. H. Boys, of Streator.

### MUTILATED BILLS NOT LEGAL TENDER.

A suit was brought against the North Hudson County Railway Company by Clarence Anderson for being ejected from a car after refusing to give the conductor other money than a mutilated bill for his fare. He won the damage suit but the company appealed. Justice Van Syckel, in the Court of Errors and Appeals, filed an opinion in which he holds that a dollar bill from the upper left hand corner of which a piece one inch and a half by one and a quarter had been torn is not a legal tender for car fare.

The opinion says that a conductor is not bound to accept a bill substantially mutilated, and that if any part of the bill is absent which might aid in determining whether it is genuine he is under no duty to receive it. The rules of the treasury department, Justice Van Syckel says, in regard to the redemption of mutilated notes relate simply to redemption and do not affect the question of legal tender.

### CINCINNATI STREET RAILWAY'S NEW WORK.

The Cincinnati Street Railway has already laid out considerable work for this spring, and will shortly commence relaying 25 miles of track with 6 and 8-in. girder rails, contracts for which have already been made with the Johnson Company. Three miles will be laid with T-rail. The Falk Company will pour 7,000 cast-welded joints on the relaid track. Delivery will also begin in a few days of the 100 9-bench open cars which are building at the shops of the Laclede Car Company, St. Louis. These will all be mounted on Peckham trucks of the type known as the "Cincinnati Standard" and which will make a total of 375 of these trucks in use on this road. The motors will be C. E. 58.

### ELECTRICITY ON THE C. M. & ST. P.

The Chicago, Milwaukee & St. Paul Railroad has applied to the city council for an ordinance authorizing it to change its motive power on the Evanston division from steam to electricity. There are various rumors as to what will be done in the future with this line. One plan that has been discussed is to take the C., M. & St. P. electric trains over the Northwestern Elevated from Wilson avenue to the city. Another rumor is that the road will form a portion of an interurban between Chicago and Milwaukee. This division has never been a paying one and the change in motive power is made in an endeavor to reduce expenses.

## FOREIGN FACTS.

At Canterbury, Eng., it is planned to construct an electric railway to Herne Bay.

Work is soon to begin on an electric railway to connect Glauhan, Meerane and Crimmitschau, Germany.

Fourteen motor cars are running on the new line at Liegnitz, Germany, constructed by Felix Singer & Co.

A concession for an additional line in Alexandria, Egypt, has been granted to the Compagnie des Tramways d'Alexandrie.

The promoters of the underground electric railway at Brighton, Eng., are S. H. Doubleday, C. F. Webber and J. W. Kersley.

The adoption of electrical traction throughout the city is recommended by the tramways committee of the Liverpool council.

The street railway at Frankfort-on-the-Oder, built by the Allgemeine Elektrizitäts Gesellschaft, has been placed in operation.

The Swansea (Wales) Tramway Company has negotiated the sale of the undertaking to the British Electric Traction Company.

Municipal ownership and electrical equipment of the street railway will be considered by the district council of Wallasey, Eng.

A committee of the Waterford, Ireland, council has recommended the grant of an electric railway concession to Mr. Palmer, the promoter.

Leuz & Co., of Stettin, Germany, propose to build an electric railway from Frankfort through Hamburg and Dornholzhausen to Saalburg.

The Norwich (Eng.) Electric Tramways Company held a meeting in London to consider a bill to authorize the construction of additional lines.

Electric traction is being considered by the council of Aberdeen, Scotland, with a view to its application on the street car lines which are soon to come under municipal ownership.

A light electric railway between Bridlington and Flamborough, Eng., is being considered by the board of trade. The engineers are W. Myers Beswick and Bernard Drake.

When the stock of the new Oldham, Ashton & Hyde Electric Tramway at Oldham, Eng., was offered to the public by the promoters, the capital was subscribed for several times over.

The corporation of Hull, Eng., seeks power to borrow £270,000 on account of the street railway. A contract for the equipment of an electric line has been placed conditionally with Siemens Bros. & Co.

The Salford (Eng.) council committee recommends that when the lease of the Manchester Carriage & Tramways Company expires in 1901 the lines be relaid, extended to 32 miles and equipped with electricity.

The Yarmouth & Gorleston Tramway Company is negotiating the purchase of the Yarmouth (Eng.) Bus Company's entire plant with a view to constructing an electric railway between Yarmouth and Gorleston.

A proposal to construct an electric railway from Ingleton, Yorkshire, to the summit of Ingleborough is being received with favor. Plans and estimates of four miles of road have been prepared by J. Hewitson.

A strong recommendation to adopt the overhead trolley system has been reported by the special committee of the Salford, Eng.,

council, appointed to visit six of the principal cities using this system. The local lines are to be taken over by the municipality. A conference has been had with the authorities of Manchester, with a view to installing similar apparatus in both cities.

The Perth Tramways Company has been formed to build lines in Perth, West Australia, to be operated by electric or other power. Capital, £125,000; registered by Williams & Neville, Winchester House, London, E. C.

At St. John's, Newfoundland, an electric railway costing \$140,000 is to be constructed by a local contractor, Mr. Reid; with whom the government has made an agreement to take over the entire steam railway system of the colony.

The corporation of Bradford, Eng., has awarded the contract to equip nine miles of street railway for electric traction to the Westinghouse Electric Company, at £14,664. Alderman Cowgill stated that the tender of the Westinghouse Company was the lowest; but the most important consideration with the committee had been the wide experience and high reputation of the company.

The Manaus Railway Company has been incorporated under the laws of New York to construct and operate 20 miles of steam or electric railroad in the city of Manaus and elsewhere in the state of Amazonas, Brazil. Capital stock, \$500,000; directors, A. J. Moxham, of Lorain, O.; A. N. Brady, of Albany, N. Y.; E. C. Moxham, C. R. Flint and E. C. Converse, of New York; J. W. Scott, of Orange, N. J.; F. W. Stewart, of Brooklyn, and F. H. Hebelthwalte, of Manaus, Brazil.

American supplies are being almost exclusively used in the equipment of the "La Capital" electrical railway of Buenos Ayres, So. America. The rails are 9-in. 90-lb. grooved girder, made by the Johnson Company; the bonds, Edison-Brown plastic and Syracuse soldered; the entire rolling stock was built by the J. G. Brill Company, is mounted on Brill trucks and equipped with General Electric motors. The iron poles were furnished by Morris, Tasker & Co., and the overhead material by the H. W. Johns Company. In the power house three vertical Ball & Wood engines are coupled direct to Walker generators of 300 k. w. each. Steam is supplied at 140 lbs. pressure, by four Stirling boilers of 250 h. p. each. The plant includes Green's fuel economizer, Conover's condenser, and two Worthington pumps. A portion of the system is already in operation, with 41 cars.

## A RECORD FROM SERIES-PARALLEL CONTROLLERS.

Previous to April, 1897, the San Antonio (Texas) Street Railway Company used rheostatic controllers, but at this time substituted the K2 series-parallel controllers made by the General Electric Company. Practically no other changes were made in the apparatus or equipment. T-H. F 30 and Edison No. 6 double reduction motors were on the cars. The power-house equipment consists of four 125-h. p. high speed engines driving two 100-k. w. Edison bipolar and two T-H. multipolar 80 railway generators. With 25 cars in operation the load varied from 450 to 650 amperes and required all the units. After the change of controllers with 26 cars the load varies from 270 to 400, an average of 350 amperes, which was easily carried by three units. This saving, President W. H. Weiss thinks, is entirely due to the new controllers.

The Consolidated Street Railway Company, of Grand Rapids, has decided to distribute prizes once every two months to the conductors and motormen for efficient work and courteous treatment of patrons. The cash prizes are \$10, \$8 and \$6, and at the last distribution 11 employes were deemed worthy of such recognition.



## PERSONAL.

The engagement of Charles E. Yerkes, only son of Charles T. Yerkes, to Miss Garron, of Morristown, N. J., has been announced.

C. H. Lawrence has been appointed manager of the Mt. Clemens (Mich.) & Lakeside Traction Company.

W. S. Dimmock, general manager of the Council Bluffs & Omaha road, was a Chicago visitor in February.

Dr. Charles H. Holmes has resigned the presidency of the Fox River Electric Railway Company, of Green Bay, Wis.

Palmer Warden, chief engineer of the power station of the Union Traction Company, Saginaw, Mich., has resigned to seek gold in the Klondike.

Frank J. J. Sloat has resigned his position as superintendent of the Akron, Bedford & Cleveland, and will be engaged in the construction of a new road.

Charles H. Kirkland, for some time past connected with his brother, H. B. Kirkland, has gone with sales department of the C & C Company, New York.

Max Osterberg, of New York, has been appointed constructing engineer for the electrical exhibition which is to be held next May in Madison Square Garden.

On February 22, Dominick Schroeckenstein, chief engineer at the power station of the Calumet Electric Railway, was married to Miss Emma Grenewald, of Minneapolis.

W. A. Kahn, of the E. P. Allis Company, has sailed for Buenos Ayres to superintend the construction on a street railway for which his company furnished the machinery.

M. J. Griffith, formerly with the Schuylkill Electric Railway at Pottsville, Pa., has resigned to accept a position with the new street railway at Buenos Ayres, South America.

C. C. Lazarus, superintendent of the East Omaha Street Railway Company, recently met with a painful accident, being caught between cars and having his collar bone broken.

C. K. Durbin, general superintendent of the Denver Consolidated, and A. L. Lawton, general manager of the Colorado Springs Rapid Transit Company, spent several days in Chicago during the month.

Thomas Fricker has retired from the office of general manager of the Ashtabula (O.) Rapid Transit Company, but will retain his position as secretary. E. R. McDowell, of Pittsburg, has been appointed manager.

E. D. DuBois, who has been superintendent of the Muncie Street Railway Company for the past two years, resigned his position February 15. B. Frazier, formerly assistant superintendent, is temporarily in charge.

The friends of Joel Hurt, of Atlanta, insist upon his being a candidate for mayor at the coming spring election. Mr. Hurt would make as good a mayor as he did street railway president, and we hope he will accept the nomination and be elected by a big majority.

G. F. Magner has been elected general manager, and A. E. Burlaud superintendent, of the Newport (R. I.) Street Railway Company. Both of these gentlemen hold similar positions with the Newport Illuminating Company, which has become a first class property through their good management.

Electrician Cooke, of the Toledo Traction Company, spent several days in Chicago, this month, visiting relatives and friends.

W. A. Harding, master mechanic of the Calumet Street Railway, Chicago, was on February 16 married to Miss Phillippie H. B. D. Marsh, of South Chicago. Mr. and Mrs. Harding visited New Orleans on their wedding trip.

H. R. McLeod, general manager of the Portland & Cape Elizabeth electric railway, Portland, Me., spent a week in Chicago this month visiting relatives. He reports considerable activity in Maine in the direction of extensions and new interurbans planned for immediate construction.

Robert H. Lerch, of Easton, Pa., has been appointed general manager of the Freeport (Ill.) General Electric Company in place of J. T. Schlacks who has resigned. This is Mr. Lerch's first experience in the street railway business but he has been engaged for a number of years in managing electric lighting plants.

W. H. Patterson, president of the Illinois Street Railway Association, was a Review caller a few days ago, and reports the prospects most encouraging for a big attendance upon the first annual meeting in June. New members are coming in nicely and our state association promises to be one of strongest of the several similar organizations.

Dr. Louis Duncan has been appointed the electrical engineer of the Third Avenue Railway Company, of New York, and will have charge of all the electrical work during the installation of the conduit system. Dr. Duncan will retain his position at Johns Hopkins University and entrust the personal supervision of the work to S. H. Brown, his assistant.

J. T. Schlacks, who has been manager of the Freeport General Electric Company, Freeport, Ill., for the past three years, has resigned to go to Mexico to superintend the construction of an electric railway on the west coast for J. C. Sibley, president, and Charles Miller, treasurer, of the Freeport Company. Mr. Schlacks will make his headquarters at Topla, Durango.

C. Densmore Wyman, whose management of the New Orleans Traction Company has been attended with such marked success, delighted his old friends in Chicago by a few days' visit here on business last week. He reports the Mardi Gras as unusually well patronized this year, and business, both general and from a street railway standpoint, excellent. His West End line, which will be remembered as having operated with steam dummies for years, is being changed to electric, and his plans for entertainments at the lake comprise an even more pretentious undertaking than last year—which was one of the most extensive and successful in the country.

## OBITUARY.

James H. Rhotehamel, president of the Columbia Incandescent Lamp Company, of St. Louis, died on February 17, after a brief illness. Mr. Rhotehamel was 42 years of age, and has been prominent in the incandescent lamp industry for the past 10 years, his company having built up a large business.

William J. Ashmead, a representative of the Ajax Metal Company, of Philadelphia, died on February 26. Mr. Ashmead had been in the employ of the company for many years and had a very extensive acquaintance among the electric railway men of the country who learn of his death with regret.

H. W. Johns, president of the H. W. Johns Company, died at his home at Park Hill, Yonkers, N. Y., on February 8, after an illness of several months. Mr. Johns was 50 years of age. For the last 30 years he has been engaged in the development of the commercial uses of asbestos, and other insulating materials. Mr. Johns was also president of the Johns-Pratt Company, of Hartford.

Denis Doren, general superintendent of construction for the Western Union Telegraph Company, died suddenly at Norwalk, Ohio, at the age of 68. Since 1850, Mr. Doren has been engaged in telegraph construction work; during the rebellion he was superintendent of the telegraph construction corps of the Department of the Potomac.

Frederick Krutz, formerly president of the New Orleans Street Railroad Company, died at the advanced age of 80 years. He was a native of Alsace and on coming to New Orleans organized the first street railway in that city. He was president and superintendent of the city railways until 1892 when he retired on account of his old age.

On February 28 occurred the death of James A. Stratton, secretary and treasurer of the Birmingham Railway & Electric Company, after an illness of six weeks from typhoid fever. Mr. Stratton was a native of Indiana and 43 years of age; he went to Birmingham 14 years ago and has been secretary of the railway company since its organization.

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### NEW PUBLICATIONS.

Steel gears and pinions form the subject of a small pamphlet, well illustrated and printed, issued from the press of the General Electric Company, under the title "A Modern Gear Plant." It contains a description of the extensive plant which that company has established at the River Works at Lynn, for the exclusive manufacture of steel gears and pinions, equipping it throughout with the most modern machinery. This pamphlet will be sent on application to any of the company's sales offices, one of which is found in every large city in the United States.

"A Pocket Dictionary of Electrical Words, Terms and Phrases," being the supplemental matter to, or an epitome of, the fourth edition of a Dictionary of Electrical Words, Terms and Phrases, by Edwin J. Houston, Ph. D. American Technical Book Company, New York, 1898. Price, leather, \$3.00; cloth, \$2.50. The last edition of Professor Houston's "Dictionary," published in 1894, contained some 5,000 words; when he came to prepare the fourth edition he found that the new words, terms and phrases which have gained currency since 1894 were in excess of those in the original dictionary with its appendix. As a result it was necessary to collate the old matter with the new in order to avoid having the second appendix larger than the dictionary. This pocket edition comprises the supplemental matter with the terms arranged alphabetically, and cross references and encyclopedic matter of the larger work omitted so that it is in convenient form for those seeking short definitions. There are over 11,000 words and about 15,000 definitions given, making it the most complete electrical dictionary ever published.

"Algebra Made Easy," by Edwin J. Houston, Ph. D., and Arthur E. Kennelly, Sc. D. American Technical Book Company, 45 Vesey street, New York. In the literature of every branch of science there is usually to be found one, or at most a very few, works which completely cover the field, and are ideal reference books. It is usually the case with books of this comprehensive character which deal with technical subjects, that because of the mathematical language necessarily employed they are not easily and understandingly read by those without mathematical training; to place the subject before this class of readers there are a host of books which have for their ostensible object the simplification of some valuable treatise so that he who runs may read; too many of them achieve but a doubtful success. The authors of "Algebra Made Easy" have attacked the problem of bringing the non-mathematical reader and the mathematical book together in a different manner, and by their little book seek to lift the reader up and not to drag the book down. It comprises a clear explanation of the mathematical formulæ in Professor Thompson's Dynamo-Electric Machinery and Polyphase Electric Currents. The object is to explain the meaning and use of the symbols used in algebra, trigonometry and calculus, so that one may understand the meaning of the formulæ in the books mentioned even though unable to manipulate them.

### REPORT OF THE CINCINNATI, NEWPORT & COVINGTON.

The annual report of the Cincinnati, Newport & Covington Railway Company was compiled by President J. C. Ernst and published in a booklet. The financial statement shows a gratifying improvement over last year. The gross earnings for 1897 were \$638,477; the net earnings \$211,197, a gain of \$31,152. The ratio of operating expenses to gross earnings were 47.8 per cent. The income per car per day was \$28.86, and the gross earnings per car-mile, 21.3 cents. The operating expenses per car-mile were as follows: General expenses, 2.36 cents; maintenance of equipment, 1.58 cents; conducting transportation, 4.86; maintenance of way, 1 cent; motive power, 1.56; lighting, 1, and tolls, 2.8 cents, making a total of 14.26 cents. On account of the efficiency of the employes there have been very few accidents, only two resulting fatally in the past year and in neither of these cases was the company to blame. An accident fund has been started to which \$1,000 is contributed each month and this was found sufficient to pay all claims and have a balance of \$3,865 at the end of the year.

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### CHANGES AT CHESTER AND WILMINGTON.

The Chester (Pa.) Traction Company and the Wilmington (Del.) City Railway Company are now controlled by Clark & Co., of Philadelphia, consequently several changes were made at the annual meetings. The new board of directors of the Wilmington City Railway Company consists of E. J. Moore, C. F. Stephens, I. C. Barr, Preston Lea, E. W. Clark and W. W. Pusey. C. M. Clark was elected president; E. J. Moore, vice-president, and T. H. Bellah, secretary. The Chester Traction Company has been reorganized and the directors are: C. F. Stevens, G. B. Lindsey, J. E. Moore, H. C. Howard and C. M. Clark. Mr. Clark was chosen president and C. F. Stevens secretary and treasurer. R. F. Fox, formerly superintendent of the Scranton Railway Company, is the new general manager of the two companies.

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### NEW BUFFALO INTERURBAN.

The Buffalo, Hamburg & Aurora Electric Railroad is about to erect a brick power house and barn after plans made by R. B. Goodman, the chief engineer of the road. Mr. Goodman was formerly connected with the Lewiston & Youngstown road. The location of the power house is to be at the intersection of the Buffalo, Rochester & Pittsburg Railway, near Orchard Park, where the company has bought two acres of ground on the Mile Strip road. The capacity of the power house will be 1,400 h. p., with water tube boilers and compound condensing engines. Four 250-k. w. generators will be direct connected to the engines. The dimensions of the boiler room will be 48x60 ft., the engine room 48x72 ft., and the car barn 45x144 ft. When the road is first operated 12 cars will be put on the line, all of the latest improved model. In shape they will be like steam cars, having truss rods, straight sides, ventilated roof and vestibules. Each car will be equipped with four 35-h. p. motors, and will have seating room for 44 persons. The company has already let contracts for \$38,000 worth of ties, poles and heavy timber.



## CONSOLIDATED CAR-HEATING COMPANY.

In 1895 the American Electrical Heating Corporation contracted to equip 700 cars on the West End Street Railway, of Boston, with electric heaters and supplied exact copies of Consolidated Car-Heating Company's heater. Since that time the former company has similarly equipped 500 more cars and extensively advertised the fact. An infringement suit was decided in the U. S. Circuit Court in August, 1897, the court holding one claim of the McElroy patent valid and the other void on the ground of the identity of the two. Both sides appealed and a decision has just been rendered by the U. S. Circuit Court of Appeals sustaining all the contentions of the Consolidated Car-Heating Company. The two claims of the McElroy patent are held not to be identical; the first is for a general method and the second for a more particular method of constructing the heater.

## WHEELER REFLECTORS.

The Wheeler Reflector Company, 18-24 Washington street, Boston, manufactures reflectors for all classes of service and its success in the business is based upon the general principle of special shapes for special uses; among the recent catalogs of the company is a special one illustrating reflectors for street railways. Reflectors for the car hood are made of true parabolic form, 11 in. in diameter and with an outer shell or case to protect the reflector from injury; these are furnished with either Thomson-Houston, Edison or Westinghouse receptacle. The illustration shows a 10½-in. parabolic reflector as applied to the dash; the case is of malleable iron and projects but 4½ in., so that the buffer fully protects it. There are no holes made in the dash; this reflector is ventilated and is dust proof. For the interior of street cars the company manufactures several styles of silver-plated mirror reflectors which are widely used. Other styles of headlights are detachable, both for electric and oil lights.



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## RAILWAY FUNERALS IN CONNECTICUT.

The lines of the Hartford, Manchester & Rockville Tramway Company connect with the Hartford Street Railway, and the Central Railway. There are three cemeteries on the lines of the first company and nine along the routes of the latter companies. Although the Tramway Company has no special car for the purpose it has carried several funeral parties in its standard enclosed cars, which are 28 ft. long, with vestibules, and 7 ft. 8 in. wide. The windows and doors at the ends of one of these cars are too narrow to admit the coffin and it has to be taken in at a side window, which is 34 in. wide and 28 in. high. The services have usually been rendered to persons from New Britain, Farmington or Hartford who were to be buried in one of the other towns through which the lines run. In some cases the cars did not make direct connection with the cemetery and in such events a hearse and carriages met the car at the

nearest point and transferred the body from the car to the place of burial. Where the parties were carried from 20 to 27 miles without change of cars it was found very much more convenient and comfortable in the winter than other means. Secretary J. W. Haynes says that without a special car the service is a makeshift, yet it seems to be appreciated by the people.

## PROJECTED NEW YORK LEGISLATION.

A bill has been introduced in the New York state legislature by Senator Seibert, authorizing the enlargement of the international bridge across the Niagara river at Buffalo, so that it may be made a double-deck structure, with room on the upper deck for trolley cars. This bridge is now used by the trains of the Michigan Central and Grand Trunk roads. It stretches across the single channel of the river above Grand Island, and has a draw span 160 ft. long. Its height above the water is about 20 ft. If the enlargement is allowed it is stated room will be provided for carriages and pedestrians. Should a trolley line be built across the bridge it is also contemplated to run the road down to the Falls along the river, there to connect with the cars and tracks of the Niagara Falls Park & River road to Queenston. By crossing to the New York side and using the tracks of the Gorge road and the Ely line on return to Buffalo a very fine belt line service could be established.

Assemblyman Bondy of Syracuse has introduced a bill which appears to have a connection with Senator Seibert's as it provides: "Whenever the terminus of any public viaduct, bridge or bridges, or public viaduct connected with any bridge or bridges heretofore or hereafter constructed in any city of the first class, or town adjoining the same, is or shall be located at or adjacent to or within one-half mile of the route of any existing street surface railroad, the corporation owning and operating such railroad may, irrespective of any provisions otherwise applicable thereto contained in any general or local act, upon obtaining the consent of the local authorities and property owners as above provided and upon complying with the provisions of the railroad law applicable thereto, extend its road or route and construct and operate its road to, upon and across such viaduct, bridge or bridges, and the approaches thereto, subject to the provisions of the railroad law; provided, however, that this paragraph shall not apply to any bridge over the Hudson or the East river."

## CONSOLIDATION AT BROOKLYN.

The Coney Island & Brooklyn Railroad Company has leased the Brooklyn City & Newton Railroad for some time but the terms of the lease have not been satisfactory and arrangements are now made for the consolidation of the two companies. The stock of the Coney Island company has been increased from \$1,000,000 to \$2,000,000 and in part exchanged for the stock of the Brooklyn City. Another reason for the increase of capital stock is that it will permit the issue of more bonds to raise money for needed extensions to the present system. A number of large handsome cars have been ordered and will be delivered in time for the summer traffic. The management anticipates a large business on the lines leading to the sea shore during the warm season.

## ECHOES FROM THE TRADE

The Boston Elevated Railway Company has placed an order for 50 open cars with the Laconia Car Company, the delivery to be May 1.

L. G. Hallock & Co., of Wheeling, were awarded the contract, February 22, to build the new electric street railway at Parkersburg, W. Va.

As fast as the underground lines of the Metropolitan Traction Company, of New York, are completed the cars will be equipped with Providence fenders.

W. H. Hooper has been appointed general agent in Chicago for the Safety Car Heating & Lighting Company of New York, George N. Terry having resigned.

C. R. Waterhouse of New Haven, has been awarded the contract to build all bridges and trestles for the Woodmont extension of the Milford (Conn.) Street Railway.

J. M. Atkinson & Co., of Chicago, have published an attractive illustrated leaflet, showing their flexible horse-shoe rail bonds and the method of connecting them to the rails.

The Brownell Car Company, of St. Louis, is busy filling orders from Baltimore, Kansas City and St. Louis, aggregating 100 cars. A good demand for cars is coming in from all sections.

The New England Electric Railroad Construction Company has been incorporated at Worcester, Mass., with \$25,000 capital stock. E. E. Carpenter is president and H. F. Leland, treasurer.

C. J. Harrington, formerly with the General Electric and lately with the Union Traction Company, of Philadelphia, has accepted a position as traveling representative for Elmer P. Morris.

Since the first of last September the works of the Ball Engine Company, Erie, Pa., have been in operation night and day to keep even with the orders for engines for electric light and power purposes.

The board of public works of Holyoke, Mass., contemplates the adoption of electric car sprinklers and is negotiating with the American Car Sprinkler Company, of Worcester, for the equipment.

Walter Phelps of Buffalo, N. Y., has taken the contract to supply poles and ties for the Buffalo, Hamburg & East Aurora Electric Railway. It is said the construction will be let to Cragg & Tench of Buffalo.

Frank E. Colbert, formerly with the Terre Haute Car & Manufacturing Company and later with Mayer & England, has taken charge of the Chicago office of the Miller-Knoblock Company, of South Bend, Ind.

John P. McIntyre & Co., of McKeesport, Pa., have received a contract to construct five miles of electric road between Boston and Buena Vista, being practically an extension of the Versailles Traction Company of McKeesport.

The Central Electric Company, of Chicago, is prepared to furnish from stock India or Amber mica, cut or uncut, in rings, washers, or any other standard form, a specialty being made of standard shapes for commutators.

The Metropolitan Street Railway Company, of Kansas City, Mo., has purchased 10 cars from the Brownell Car Company, of St. Louis. Five of them are the combination type, 45 ft. long and capable of seating 52 passengers.

The Forest City Electric Company, of Cleveland, O., has recently issued an illustrated catalog describing the different sizes and forms of its roll drop and drop forged commutator bars, also its protected rail bond and method of fastening bond to rail.

The St. Thomas Street Railway Company, of St. Thomas, Ont., has let a contract for electrical equipment to the Canadian Electric Company, and for eight cars to the Ottawa Car Company. Bids are invited for wiring and special work to the amount of \$12,000.

In the issue of March 5 the "Electrical World" celebrated its twenty-fifth anniversary and the number was of special size and merit. In the supplement were shown some interesting reproductions of 150,000-volt discharges and the subject was treated in a very scientific manner in the editorial columns.

G. H. Klumph, formerly with the Variety Iron Works, Cleveland, is now the western manager of the Fuel Economizer Company, of Matteawan, N. Y. A good business is being done by the western agency, several large plants being installed and the prospects for future orders are bright.

The Jackson & Sharp Company, Wilmington, Del., recently shipped eight cars to the Pensacola (Fla.) Electric & Terminal Railway Company. Four of them were 30 feet open and the remainder closed cars, 18 ft. 6 in. long. They were all handsomely finished and mounted on Peckham trucks.

The Sargent Company, of Chicago, appreciates the value of making its literature attractive in form as well as instructive, and its pamphlet on the "Diamond S Brake Shoe" is as handsome a trade publication as we have ever seen. It comprises the results of the laboratory and road tests of this brake shoe.

The General Electric Company has received an order from the Consolidated Traction Company, of Jersey City, for double 57 motor equipment for 40 cars. The Omaha & Council Bluffs Railway & Bridge Company has just ordered one 325-k. w. direct connected generator and 17 G. E. 57 double motor equipments.

The Chicago General Railway Company has let contracts for duplicating the unit it now has in its power station. A 500-h. p. Corliss engine is now being built by the Bates Machine Company, of Joliet, Ill., and the 300-k. w. generator is ready for shipment at the works of the General Electric Company. Additional feed wires will be strung in the spring.

The Garton-Daniels Electric Company, of Keokuk, Ia., has received a letter from the Atlanta Consolidated Street Railway Company testifying to the efficiency of the Garton lightning arrester. They have been in service for four years and have proven more satisfactory than any other, and have effectually protected the apparatus from damage.

E. W. Sherman, railway representative of the Beckwith-Chandler Company, New York, well-known manufacturers of railway varnishes, will hereafter devote his entire time to the western business with headquarters in Chicago. Mr. Sherman knows from experience just the special needs of street railway managers, in the varnish line, as he was formerly superintendent



of the North Chicago Street Railroad, and has made a careful study of the subject. His western friends will be pleased to learn of his return to Chicago, and wish him success.

Engene Munsell & Co., of New York and Chicago, importers and dealers in "Amber" mica, report a very gratifying demand for all their insulating specialties. The India mica is being used very largely by electrical manufacturers and street railway companies, both in this country and in Europe, on account of its being free from iron as well as because of its high insulating qualities.

The Consolidated Car Fender Company, Providence, R. I., which manufactures the "Providence" fender for street cars, is finding its business better than ever before and is running its two factories at their fullest capacity, and is still unable to supply fenders as fast as they are ordered. Among the roads ordering fenders is the Metropolitan, of New York, which is equipping 350 cars.

J. A. Fay & Co., Cincinnati, O., who manufacture what is probably the most extensive line of high grade wood-working machinery in the world, have just issued what may be termed an illustrated wall catalog of some of their principal machines, which will prove most valuable and convenient for reference. It illustrates and briefly describes nearly 100 machines for mills, factories, car shops, etc.

D. L. Bates & Bro., of Dayton, O., are prepared to supply the trade with all kinds of desk and ceiling electric fans. The various kinds of fans made by this company are described in a neat little pamphlet. Fans are kept in stock for running on circuits from 110 to 500 volts; the latter can be connected to a railway feeder. Small rheostats may be attached to the fan circuits regulating the speed.

The Brownell Car Company, St. Louis, reports that its orders for the first week in February exceeded by three times the entire business for 1897, and that there are yet other orders in sight. Among the large orders received may be mentioned those for the Baltimore Consolidated Railway Company, the Metropolitan Street Railway Company, Kansas City, Mo., and the Union Depot Railroad Company, St. Louis.

A very handsomely illustrated catalogue on decorative and candelabra lamps has been printed and circulated by the General Electric Company. It represents all the styles of series and multiple candelabra lamps, multiple sign lamps, series decorative lamps, and lamps for special uses, as bicycle, telephone, dental and surgical lamps made by the Edison decorative and miniature lamp department at Harrison, N. Y.

W. R. Garton, 414 Ashland block, Chicago, has been appointed western representative of the Keystone Electrical Instrument Company, of Philadelphia. This is another move that the company has made to secure increased sales in this district. Since the first of the year the works have been in operation day and night to fill the orders received and preparations are now being made to enlarge the manufacturing facilities.

A large water power station at Dolgeville, N. Y., was recently opened with considerable ceremony. The present installation consists of three 350-k. w., alternating current generators direct connected to the water turbines, but the ultimate capacity of the station is to be 3,000-h. p. The electrical apparatus was furnished by the Westinghouse Electric & Manufacturing Company. The current is used for lighting purposes and for operating several factories.

The Duff Manufacturing Company, Allegheny, Pa., advises us that their business in Barrett compound lever jacks is very good and that the outlook for the year is very bright. The export trade is increasing, and during the past few months it has ship-

ped large orders of different sized Barrett jacks to Hayti, Costa Rica, Mexico, Argentine Republic, Australia, Sweden, Russia, England and South Africa, and is at present negotiating sales for other countries.

Stanley Green, western manager of the Fuel Economizer Company for the past five years, and S. S. Howell, who has also been connected with the same office, have formed an agency with headquarters at 902 Fisher building, Chicago. They are the western agents for the American fuel economizers made by Broomell, Schmidt & Co., the Chicago agents for the Case Refrigerating Company and several other companies making steel stacks, coal and ash handling machinery, etc.

Norman & Evans, of Lockport, N. Y., are introducing a steam switch-back merry-go-round which should prove a great attraction and money maker at a summer resort or street railway park. The machine has an undulatory rotary motion, operating eight cars, designed to represent Venetian gondolas. The motion combines the sensation of the switch-back railway with that of the merry-go-round. A military band organ is attached and plays continuously, whether the machine is in motion or not.

The Stever Rail Joint Company, of Canton, O., advises us as follows: We have been extremely busy getting out some large orders for the Stever rail joint for spring delivery, and the joints everywhere are giving the best of results. All we ask is a trial order, and after that the business comes without further solicitation. We have made several improvements in manufacturing the Stever rail joint which go to make it the strongest and most perfect one on the market.

The Dorner Truck & Manufacturing Company, Cleveland, will engage in the manufacture of trucks, E. C. Dormer, formerly of the Dorner & Dutton Company, being secretary of the new company. Mr. Dutton has been in the foundry business since 1880. The works have been established in the building formerly occupied by the Brush Electric Works at the corner of Mason and Belden streets, with track facilities in the yard. New machinery, power cranes for loading, etc., have been installed, and the principal business will be the manufacture of street railway trucks, in which Mr. Dormer has had a long experience.

The Partridge Carbon Company, of Sandusky, O., is introducing a new generator brush of much merit. It is made of plumbago and other ingredients that give it a high conductivity and low resistance. There is no perceptible wear on the commutator and no sparking, which recommends it for machines carrying heavy loads. Large orders are being received for the "self-lubricating carbon brush" from all parts of this country and abroad. The company has just issued a new catalog which will be furnished on application.

The Pennsylvania Car Wheel Company, of Pittsburg, was incorporated January 14 and has already built a steel foundry building with an up-to-date equipment. It is the intention to make high-grade wheels of guaranteed durability and strength, the capacity being 225 wheels per day, but this can readily be doubled. The works are located on the lines of the Pennsylvania Railroad Company and a branch of the Baltimore & Ohio. The officers of the company are: J. W. Rhodes, president; W. L. Elkins, vice-president; C. V. Slocum, secretary and treasurer, and A. W. Slocum, superintendent.

Since issuing its last regular price list the Keystone Electrical Instrument Company, 9th street and Montgomery avenue, Philadelphia, has so extended and improved its line of instruments, among others having added a complete line of portable instruments, that it was considered desirable to bring all the separate lists and announcements together under one cover, and this has been done in its catalog, No. X. The Keystone instruments are well known, and are pleasing in appearance, sensitive, accurate, constant and durable.

The Boston Electric Light Company will consolidate all its small stations into one mammoth generating plant to be erected in South Boston. There will be four three-phase alternating current generators of 1,500-k. w. each with a reserve capacity of 50 per cent, making a total capacity of 12,000 h. p. They will be of the revolving field type, permitting a voltage of 2,200. These large generators, together with two small exciters, 18 synchronous motors, two rotary converters and other electrical apparatus, will be furnished by the General Electric Company.

The Q & C is now manufacturing the self-feeding rail drill patented by M. M. Moore and described and illustrated in the REVIEW of December, 1897. Some minor improvements have been made, and overhanging fastenings have been substituted for the under clamping device to the rail. The Q & C Company reports a number of good orders for the Q & C-Stanwood steel car steps, one of them being for the United States cruiser Atlanta. The new supplementary catalog illustrates the different styles of steps made, together with information regarding the rail drill.

Among the noticeable improvements in street railway rolling stock, made desirable by the development of the business, is the abandonment of the wooden shutter blinds in closed cars, and the substitution for them of Pantasote curtains which have long been recognized in steam service as handsome, durable and in every way desirable. Among the latest of the numerous street railways using them is the Metropolitan, of New York, which has adopted Pantasote for all its cars; also the Brooklyn Heights and the Long Island roads. The number of electric and steam cars so furnished is estimated at 1,000.

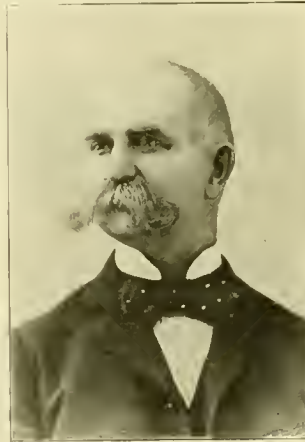
The South Side Elevated Railroad Company, of Chicago, gave the privilege to five of the leading car heating companies to equip one car each with electric heaters. These cars have been in operation on one of the other elevated roads and the heaters have been thoroughly tested. As a result of this a contract for the other cars has been given to the Gold Car Heating Company, of Chicago and New York, for 3,000 electric heaters, one of the largest contracts of this kind ever placed. Each car is supplied with 24 "Gold Standard" heaters so wired as to permit of six graduations, controlled by the regulating switch.

By recent action of the board of directors of the Dornier & Dutton Company, of Cleveland, the name has been changed to the Van Dorn & Dutton Company. The officers now are: President, J. H. Van Dorn, who is also president of the Van Dorn Iron Works Company; vice-president, E. I. Leighton, president and general manager of the Cleveland Punch & Shear Works; secretary and treasurer, W. A. Dutton, who is well known to the trade as the general sales agent of the Dornier & Dutton Company, and who will have full charge of the sales department of the new company. H. H. Hodell and T. B. Van Dorn, engineer of the Van Dorn Iron Works Company, are directors. Frank Schneider, formerly with the Brush Electric Company, and recently superintendent of the Sperry Engineering Company, has been appointed superintendent of the truck and gear department.

A man is known by his hat and boots; therefore the cap is one of the most important parts of a uniform. F. H. Newcomb, of 11 Washington Place, New York, who is known as the largest manufacturer in the world of uniform caps only, has recently sent to the trade a small booklet illustrating a few of the styles of uniform caps worn and giving an idea of the class of work done by him. Those who attended the Niagara Falls convention could not have failed to remark the large and handsome exhibit of uniform caps made by Mr. Newcomb. A few of the references given for New York and Brooklyn are: Metropolitan Street Railway, Postal Telegraph Cable Company, Adams Express Company, Eastern Steamship Company, Atlantic Avenue Railroad, Kings County Elevated Railroad, Brooklyn Heights Railroad, Brooklyn Post Office, Brooklyn Fire and Police Departments.

The Mica Insulator Company, of 218 Water street, New York, 117-119 Lake street, Chicago, and 12 Camomile street, London, reports a heavy increase in the volume of business. Many of the large manufacturers are using its "Micanite" segments exclusively in the construction of their generators and motors. The company has made many valuable improvements in the well known insulation, "Micanite," and is turning out a very fine commutator segment. It would be pleased to send a set of segments for any of the smaller machines, as sample, to electrical manufacturers or repair concerns who may make application. The M-I-C friction tape and "Empire" cloth are meeting with a large sale. They are used for the winding of fields and armature coils, and make the highest possible grade of insulation.

A. N. Loper, who has been prominently identified for the past five years with the New Haven Register Company, has resigned to accept an offer from the Sterling Supply & Manufacturing Company, of New York. Mr. Loper has been the general traveling salesman of the New Haven Company, and during his connection with that concern has covered the country thoroughly, having at one time or another canvassed everything east of the Rocky Mountains. He has made a very large acquaintance, and a correspondingly large number of friends, all of whom will wish him great success in his new alliance. He will make Chicago his headquarters and devote a large share of his time to the western and southern territory.



A. N. LOPER.

The Wabash Railroad Company has completed all arrangements for the operation of its own freight trains as well as its own passenger trains to and from Buffalo. Leases of the Grand Trunk and Erie tracks have been ratified and the Wabash thus practically extends its system eastward to Buffalo and gets the use of terminal facilities there. The line to be used will be from Detroit to Glenoe, thence, via the Southern line, through St. Thomas, Tilsburg, Sincoc and Welland to Buffalo, via the International bridge at Fort Erie, and from Welland via Allenburg Junction to Suspension Bridge. From Suspension Bridge the Erie line will be used into Buffalo. The Wabash will also have the right to use the Erie Belt line from the International bridge at Fort Erie around the city to the local freight houses, yards and tracks of the Wabash in Buffalo. From Chicago this is a shorter line than either the Michigan Central or the Lake Shore.

The McGuire Manufacturing Company has just completed delivery of the electric trucks for the South Side Elevated. The old trail trucks have been taken from under the coaches and the new McGuire electric truck substituted without interrupting the traffic of the road. This was accomplished by putting in the shops five cars at a time, which were completely fitted electrically, and then put back into service as trailers, so that as soon as the current is turned on every car in the system can be operated independently. This is the important feature of the Sprague system. Each coach is carried on one motor and one trail truck. The fact that the motor end of the car rides easier than the trailer end is a compliment to the builders of the motor trucks, which are ponderously heavy things for their size, weighing, with the motor, about 14,000 lbs., while the wheel base of the truck is only 5 ft. 6 in. The Brooklyn Elevated Railway has begun a similar change from steam to electricity, and the McGuire Company has the order for trucks; the Walker Company, of Cleveland, will furnish the motors, and the Sprague controller system will be used. The McGuire Manufacturing Company is also busy on truck orders for the Toledo Traction Company; the Consolidated Traction Company, of Pittsburg; the Steubenville





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### CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged to any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

### DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supply or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that supply. We make no charge for publishing such notices in our DAILY BULLETIN.

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The question of whether the Toronto Street Railway must pay taxes on its poles and rails is not yet finally settled, though it has been pending in the courts for three years. The decision of the supreme court, noted in this issue, is adverse to the company.

Many roads in southern Indiana and Ohio have been seriously inconvenienced by floods which occurred the latter part of March. Fortunately no extreme damage was occasioned to power plants, the chief losses being from shut-downs and on country lines some track washouts.

Indications point to an early season for putting the open cars in service and the opening of pleasure resorts. Reports from resort roads show the very general intention to enlarge the number of features of past years, and that this department of created travel is being better appreciated and understood each year.

No clearer demonstration of the folly of Detroit, which built a great system of street railways paralleling existing lines in order to experiment with 3-cent fares, can be furnished than in the fact that since the consolidation of the two companies the number of employes has been reduced 30 per cent. It was the public who paid for the now useless men.

It is announced that on May 1, Chicago is to have motor cars, and join the ranks of London and New York. For some months a few delivery wagons, for which storage batteries furnished the motive power, have been in use, and here and there one meets with an enthusiast who has his own motor-driven pleasure vehicle. The success of the new enterprise will be watched with interest.

Perhaps the busy manager who daily receives requests to give some new device a trial on his road thinks that the field of street railway operation is already well covered. There is, however, a demand for a good track brake for use on long and heavy grades, and the demand is each year becoming greater because of the increasing number of interurbans. The opportunity awaits the inventor with the "right thing."

The road which has been most seriously affected by the bicycle, so far as we know, is that at Woonsocket, R. I. Most roads have lost money, and that is no laughing matter, but only in this instance has the running time been interfered with. This latter trouble is of course not a direct result, but followed because the company decided that there would be no more cyclists injured by its cars if caution on its part could prevent, and cars now "stop when within 100 ft. of a moving bicycle approaching the car."

In the District Court at Duluth, the street railway company has won its case against the county, which since 1896 has collected a tax on the company's franchise. The court rules the franchise tax was not properly assessed and orders the amount so collected to be repaid. The county auditor states that if the assessment as made was irregular, it cannot be made at all. While the suit was brought by the street railway, it affects all other corporations in that city working under municipal grants.

And now Baltimore, St. Louis and Chicago are considering the conversion of part of their cable lines to trolley. The mileage of cable track is decreasing each year, and what at one time gave promise of becoming the universally adopted system of mechanical power is gradually growing less and less. The great advantage of using but one system of motive power on all the lines of a company, and the interchangeability of car service on trolley lines, with ease of getting around blockaded sections in case of fires and similar emergencies, is felt by every manager operating cable lines. While the cable is good, the trolley is for most places much better.

When the Post Office Department recently established an office in a new suburb in Pennsylvania, it christened the place "Trolley." Now the inhabitants thereof, who would not have had any town but for the trolley, are petitioning the department to change the name and bashfully suggest "Loveland" is a great deal better. We must admit that Loveland does have a mild, patriotic and affectionate sound, though it is a question whether it would be any more attractive to young people than Trolley. For the sparking proclivities of the trolley are well known, and have helped out many an ambitious but poor young man who could not afford the time-honored "rig." Moreover, Trolley is indicative of the greatest advance of the century, is strictly up to

date, has all kinds of go to it, and never fails to find room for one more. All these are attributes of which any budding town might be proud. As the trolley has come to stay we hope the P. M. G. will allow the name to remain over this new stamp dispensary.

The Supreme Court of Massachusetts has somewhat altered the old Biblical rule regarding lost eyes, and entered up damages against a street railway in the amount of \$5,045 for the loss of an optic by a patron of its pleasure resort. It seems among the attractions was a freak without hands, who posed as a crack marksman, working a gun with his elbows and toes; and missing the target he shot out an eye for the plaintiff who had been brought there in defendant's car. The decision opens up a new avenue of damage suits, and the ruling closes with the following opinion: "It cannot be held that the plaintiff assumed the risk. He might well rely on those who provided the exhibition or invited him to attend, to take due care to make it safe from such an injury as he received."

Prior to the passage of the Allen law in Illinois, which even now it is sought to make the issue of the next campaign in this state, we were treated to numerous dissertations on the advantages of home rule for cities, particularly in the matter of street railway franchises. In Missouri the larger cities are organized under constitutional provisions and therefore it might be thought that they would be secure in their rights to grant franchises on such terms as they might see fit; the state, however, is seeking to exterminate certain street railway corporations because the city granting the franchises did not exact at least 2 per cent of the gross receipts as compensation, in accordance with the Julian law passed in 1895. The question appears to be, how can the street railway best be milked?—in Illinois it is by the city; in Missouri by the state.

A Maryland reformer is making the attempt to do away with crowded cars by fixing the rate at 3 cents for standing room. Whether the bill now pending in the legislature will finally pass and the experiment made cannot now be stated, but it might not be such a bad thing to make a trial on some road. And if the trial is to be one worthy of the name it should be undertaken on the plan of a western manager, who, when he was confronted with the same problem a few years ago, announced his approval and determination to remove the seats from most of his cars, and hang out the sign, "Standing room only." It really would be amusing to see how many people of the class who at stated intervals introduce such impractical measures, would avail themselves of the 3-cent standing ride. We thoroughly believe that every company should spare no effort to supply seats for as many of its patrons as possible; but under the existing conditions in American cities it is a physical impossibility to take care of the deluge during certain rush hours with a seat for every passenger. To have two classes of fares, however, in the same car, is something the public does not want and companies could not carry out.

A practical demonstration of the working of the low fares of which so much has been printed and talked by people who were better posted on other subjects, is found in the recent

strike on the city lines at Saginaw, Mich. Under an order of court, the receivers of the road were compelled to sell regular tickets seven for a quarter, and workmen's and school tickets nine for a quarter. It was these same low rate tickets which brought the road into the receiver's hands, at which time an ineffectual effort was made to raise the rate. With limited earnings the service could only be maintained by increasing the hours of labor, and in their appeal to the public the striking employes set forth they are compelled to work 12 to 14 hours each day for a "day's pay," which was recently raised from \$1.34 to \$1.55. The trouble was settled after a few days by a reduction in the hours, the pay being unchanged; and an order by the court allowing the receivers to raise the rate of fare.

The incident should impress the general public with the fact that the low rates it often demands are only possible at the expense of the rights of others, and we do not believe the American people, when they understand the real facts in the case, will want to save the small fraction under a 5-cent fare when it has to be done at the expense of the welfare and rights of the street railway employes.

We have been much interested in a study of the report of nearly fifty roads, including each section of the country, and about evenly divided between large and small companies,—as to the comparative earnings for the first quarter of '98. As a rule, and with scarcely an exception north of the Ohio river, the earnings of the last quarter of the year are always much better than those of the succeeding three months, or first quarter. This is easily explained by the good weather which usually prevails until Christmas and the holiday riding of two to four weeks.

In the reports we have collected it has been gratifying to note that the decrease in earnings for January, February and March, as against October, November and December, is very much less than the decrease of one year ago; while a comparison of the first quarter of '98 with the same period twelve months ago shows a gain which is as surprising as it is satisfactory. Only one road reports a percentage of decrease, while the others range all the way from 3 per cent for the poorest gain to 25 per cent for the best. The majority report 6 and 7 per cent gains in revenue, and nearly all predict the prospect for the summer business as "good."

The explanation, as every manager knows from experience, lies chiefly in the resumption of industrial operations, which call out an army of workers for their ride twice each day; and the riding done by their families when the wage earner is employed.

One manager in a manufacturing town in Ohio, whose road has been going through deep waters for two years past, and which now shows an average gain of 24.90 per cent in earnings for the first quarter of '98, states: "Our industries are all in operation and with orders on hand to keep them going for several months. Practically all our idle labor has been employed; there is no skilled labor unemployed; empty houses are filling up, and the general outlook has not been so good since 1892."

It is devoutly to be hoped nothing will occur to turn back the improved conditions or to prevent their working out into that full measure of prosperity which means as much to the laborer striving to clear off the mortgage on his little home, as to the capitalist endeavoring to bring his securities up to par again.



## HOW WOULD WAR AFFECT STREET RAILWAYS?

**A Question Which is Confronting Every Manager in the Land—Expressions from a Large Number of Leading Presidents and Operators—Opinions Divided—Some Look for Increase in Their Earnings—Others Would Suffer.**

As we go to press the eventual outcome of our national difficulties with Spain is still an unsettled question, and, without entering into any discussion of the matter in dispute, it is proper to consider what the effect is likely to be upon street railway interests, in event of war.

As a well-known manager states in the opinions quoted below, that effect is largely a problematical one; and it is further probable that, as usual with street railways, the local conditions will largely govern. At the same time war could not but have many results which would be generally common to all.

It must be admitted at the outset that new projects, which are dependent on the placing of any considerable amount of securities would, temporarily at least, suffer. With a fluctuating money market, and that uncertainty which always prevails during hostilities, capital certainly will be wary of investment in operations which are not directly to be benefitted by government orders. On the other hand, it is pointed out that, while war is destructive and a great and extravagant consumer, vast sums of money are rapidly put in circulation. This money of necessity must be spent within our own borders, and all those industries which are operated to furnish war supplies will furnish work for thousands of men day and night, and the demand for raw materials and labor will be very great. These workers would be patrons of our transportation lines, and the money so earned will increase the ability of their families to ride.

A gentleman connected with the Japanese government said recently to the writer that the result of the war with China had been, during and especially since the conflict, to stimulate business and industries of all kinds to a degree never known before in Japan. It would be humiliating to think that a great nation of 70 millions people, with all the resources and boasted abilities which this country possesses, could suffer to any alarming degree in a conflict with a bankrupt power of only 17 millions, three-fourths of whom can neither read nor write. A visitor to this office who has traveled about the world extensively, with unusual opportunities to observe, and who has witnessed Spanish military evolutions in the past, expressed himself as confident that "the Yankees could go out to sea on logs and clean out the Spanish." While it does not behoove us to boast, it does not seem that there is good cause for that degree of apprehension which exists in the minds of some. We have weathered a long and terrible financial crisis, and the commercial interests of the country have had ample time to prepare for war conditions, and have done so.

Those street railway enterprises which were still unfinished up to the middle of March have been as completely tied up as if war had actually been declared; and this inability to proceed seems likely to continue as long as matters are unsettled. Indeed, some feel that actual hostilities could not work a greater hardship, and that, even with war, a fair prospect of its early termination would enable them to discount the result and float their bonds. We know of a large number of such tied-up enterprises, and unless relief is found soon in some definitely settled policy, some of them

are likely to go over to another year, as interurbans particularly are anxious to take advantage of as much of the summer riding as possible, and avoid starting out with the smaller business and increased expenses incident to operation during winter months.

We feel sure our readers will gladly avail themselves of the opportunity to learn how the situation and probabilities incident to a possible war period are viewed by the operators in the country, and we publish here the opinions of some of the best-known managers. In some cases these opinions could only be secured through a promise not to reveal the source of information, and we therefore must respect such requests.

Capt. Robert McCulloch, who knows the smell of powder from four years service on the field, finds it very difficult to predict results, and says :

You desire an answer to the question, "What will be the effect of war upon street railway business."

I don't think it possible to answer the question without coupling with it conditions that might exist.

The effect would be widely different in New York and St. Louis; the former city might be so filled with soldiers and visitors that a large addition to the present equipment would be necessary to accommodate the traffic, whilst in St. Louis the reverse might be the situation.

But to answer the question intelligently we must know, or at least suppose we know:

Will it be a naval war, and confined entirely to the high seas?

Will Cuba be the battle-ground?

Will Spain be the battle-ground?

Will the United States be the battle-ground?

What will be the duration of the war?

Will 50,000 soldiers be sufficient, or must our army number five millions?

Will other nations be drawn into the contest?

As I am unable to answer any of these questions, I have no starting point for my argument, so I don't think my opinion will give you any enlightenment.

A western manager; city of 100,000: With reference to what effect we think war will have on the street railway business, I would say that in the western states and in an agricultural country, where we are, we think that in case of war business will improve. It will certainly make prices of all grains higher, and also farm products, meat, etc., and the people will have more money and will feel more like spending it. We think it will not only improve street railway business, but steam railroad and all general business.

Another manager, inland city, operating 1,000 cars: In our opinion the business of street railways will be improved should war be declared against Spain. Our theory for this is that war will instigate an immense expenditure of money through furnishing troops with provisions, transportation and clothing, and factories of all kinds manufacturing goods which the government may use, will be run to their fullest capacity. This will improve conditions for the laboring class by the employment of a greater number, and the plac-

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ing in the hands of laboring classes additional money, will enable them to expend more for transportation and the necessaries of life. The greater the prosperity of the laboring classes, the greater the street railway travel.

W. F. Kelly, general manager Columbus (O.) Street Railway: I have not given the matter serious consideration, because, first, I do not anticipate there will be a war. Should war occur, however, I believe the results to street railway interests, so far as their earnings are concerned, will be beneficial rather than otherwise. Such an event would stimulate manufacturing and commercial industries, and would awaken great activity among all classes, which would result in an increased travel on street railway lines. This view, of course, supposes that no very large percentage of our population would actually be engaged in war service; that the result would not be so disastrous as to paralyze our commercial interests. A declaration of war would doubtless at first affect stock values, but even this, I believe, would be only a temporary depression.

From a manager in the Southwest: I do not care to be quoted on the question you propound, but do not think that a foreign war will have any disastrous effect on street railways in this territory.

The president of a 300-car road in the Central States says: The effect of war upon street railway business at present would, in my judgment, largely check improvements and extensions, but if it were not too prolonged would temporarily stimulate travel. In other words, capital will be timid in every way, which will doubtless throw many men out of employment, who will congregate in the cities and enjoy themselves so long as they have money to do so. Of course if many men should be called into service on land, the effect would be different; still, I think it would be very largely a naval battle and not require many men to carry it on.

The president of a Southern city road: Having had little faith in war being declared, I have not considered what effect it would have on the business of the street railway companies throughout the United States. Without having given the matter mature consideration, I would not like to express an opinion for publication. I might state, however, that in the event war is declared, I believe that, owing to the probable mobilization of troops in and around this city, this company's business would show an increase of 25 to 30 per cent.

The feelings of a manager in an important Southern seaboard city is voiced in the following: I am certain that the immediate effect of a rupture between our country and Spain would be one of injury to street railway business, in common with most all other business enterprises throughout the country, especially in seaboard cities.

The cessation of commercial carrying on the ocean would necessarily affect the number of men employed on the docks and wharves, and would further diminish receipts of the street railway companies in cities where laboring men of that class constitute a part of the street car patronage. Some of this loss would perhaps be made up in cities where, by reason of the massing of troops there, some riding from them would be obtained.

As an actual fact, even now in our city along our wharves the number of ships being loaded has been greatly reduced by reason, as I understand it, of the refusal on the part of the underwriters to insure cargoes at usual rates, and our receipts from longshoremen and others upon the docks show a corresponding reduction.

Further, in a general way, war means timidity on the part of capitalists in promoting new enterprises or to continue improvements, and this means in many cities a reduction in the number of men employed in such enterprises or improvements, and consequently a lessening of riders upon the street cars. War also means higher prices for material, and the result of this will be reflected in greater expenses in the operation of our cars and in our repair and maintenance account.

I can but feel that war will be a most deplorable thing in every way, as regards business enterprises in our country, with perhaps the exception of such factories as will be employed in the furnishing of munitions and material for the government.

As a lover of my country and its honor, however, I am, in common with all the dwellers in this fair land, jealous of our national reputation, and if peace cannot be honorably maintained, will be glad to see recourse had to arms; but it is my hope that every effort will be made that can be, consistent with justice and honor, to avoid a conflict, which I think can only be regarded as likely to result disastrously for the time being, at least, to our business interests.

The manager of a well-known company in New England reflects conditions there in these words: That, undoubtedly, if war were to be declared between the United States and Spain, it would have a very depressing effect upon the general business interests of this country. As a matter of fact, the uncertainty existing has already caused the monetary interests to act very cautiously and conservatively, as all banking interests are compelled, for their own protection, to withhold making loans, etc., excepting when the security is unquestionable and the rate very remunerative.

Even under these conditions they prefer not to make loans, but to await developments.

The second effect, to my mind, would be an inflation of values of all commodities in this country, to what extent it would depend very largely upon how long the conflict was continued, and after the ceasing of hostilities and peace is declared, then comes the reaction, and we are left in no better, if as good, condition than we are at the commencement of the hostilities.

I suppose out of the 70-odd million people in this country 10 million will have to bear the great burden of carrying on war, while 60 million are urging immediate action, regardless of the consequences.

To our mind, great credit is due to the conservatism of the President. With us, in this section, he is highly praised by the thinking people.

I have briefly expressed my opinion, of which I shall expect you to withhold the name of the author.

Israel A. Kelsey, general manager, West Haven, Conn.: I do not believe that in case of war between this country and Spain that it would affect the business of this line to any extent, unless there should be an attack on coast cities.



M. R. McAdoo, manager Paterson (N. J.) Railway Company: I have never seen the effect of a war upon any business, and therefore do not feel that I am competent to give an opinion on the subject. I understand from some of the men in our city that during the war of 1861-65, that Paterson was very busy, on account of the fact that all of its locomotive works were building locomotives for the government and employing for this work a great body of men, who were paid excellent wages. Using this as a basis for forming an opinion, I should say that in any city largely engaged in the manufacture of goods which would be used by the government in prosecution of a war, that the street railway interests would be benefitted. But otherwise, as I stated above, I have had no experience to guide me in forming an opinion.

John I. Beggs, general manager, Milwaukee Electric Railway & Light Company: In my opinion, in the unfortunate event of war with Spain, street railway business would not be perceptibly affected, so far as pertains to volume of business or cost of operation. There might be greater difficulty in obtaining capital to make extensions or build newly projected lines.

John B. Parsons, vice-president and general manager, Union Traction Company, Philadelphia: I see no reason why there should be any material effect for the time being upon street railway business. In the event of war I certainly do not think their business would be decreased any.

E. G. Connette, general manager, Nashville Street Railway: I do not believe that the prospective war with Spain will affect our business to any extent. Our city is so inland and our business and manufacturing interests of such a nature that I do not apprehend a depressing effect. I do hope, however, that there is to be no war with Spain and matters will be satisfactorily settled before hostilities occur.

W. W. Magoon, secretary of the Consolidated Light & Railway Company, of Huntington, W. Va., speaks of the resources of his state: We have your esteemed inquiry, and must admit our inability to reply very intelligently. We do not consider war a very healthful thing at any time, and it is very deplorable that such difficulties cannot be amicably and honorably settled in this enlightened age so near the close of the 19th century. Locally we do not feel that war with Spain or with any other country would materially affect our street railway interests, only so much as it affects business generally. While it would not affect the price of our stock in trade, it would undoubtedly advance prices of material we have to buy, more particularly coal, which is a large item of our current expenses. I think it is the general belief of our people that war would benefit our individual state of West Virginia, as we are great coal and timber producers, and it would create a large demand for these products, and our credit is largely based on our vast amount of undeveloped timber and mineral lands, which would offer good, safe investments for capital that is now invested in stocks and bonds which would be more or less jeopardized by the opening of hostilities.

George E. Maltby, superintendent of the Jamestown (N. Y.) Street Railway Company, says: We are inclined to believe that, should war be declared, the effect would be to force those who are now along the coast into the interior

for safety. This, of course, would necessarily increase the business of all street railways, and especially those which are fortunate enough to have summer resorts in connection with them, and as far as our company is concerned, we would be very willing indeed to make a great effort to take care of all who might deem it advisable to locate in or near Chautauqua, Jamestown or Celoron.

H. F. McGregor, manager of the Houston (Tex.) Electric Street Railway, writes: I generally have pronounced opinions on all questions, but have been unable to form any on the effect which war would have on street railway business. I have a vague idea that in some localities that furnish war supplies business will be stimulated and the street railways benefitted; in others business will be depressed and street railways will be affected thereby. I do not expect any beneficial effects in this city from war.

T. J. Nicholl, general manager of the Rochester (N. Y.) Railway Company, writes: In my opinion, so far as this city is concerned, a war with Spain would have very little effect upon our street railway business. I presume that in communities where large amounts of war supplies would be produced the effect would be to stimulate business somewhat, and hence improve street railway business.

George D. Munsing, general manager of the two street railway companies at Tampa, Fla., says: Owing to conditions and location of our company, we would be considerably benefitted in case of war, as Tampa, undoubtedly, would be headquarters for supplies and many troops of soldiers. I do not see how war would affect the street railway business of the United States unless there should be a demand for employes, which I hardly think there would be.

From a Chicago man: As to the effect of war upon street railway business, my opinions are simply guesses—nothing more nor less. I guess that the street railway business of Chicago would not suffer in event of war, unless Chicago were invaded and carried by the enemy, which, in my opinion, is a very remote contingency.

The president of a well known Southern road says: A short conflict say of three or four months will not be felt by the street railways of any part of the country. But a war of longer duration will affect the earnings of the street railways of the north and east by reason of the closing of factories of all kinds, thereby throwing out of employment thousands of people who ride each day. We of the south will not feel a war unless it is of longer duration than I think this will be. War may effect to a slight extent stocks and bonds of street railways even if it is of very short duration, though I very much doubt it.

Here is one from a manager who says in his case war already exists: The Lord only knows what the effect of war would be on street railway interests. Whatever I might say would be only a guess, and I should dislike to find myself on the wrong side. I leave today for —, where there is war in the legislative halls on our interests which we know would be fatal to us. We feel we are too far inland to be hurt directly by a foreign war. It is the home wars that affect us.

Russel B. Harrison, president of the Terre Haute Electric Railway Company, writes: "I do not think war will have any injurious effect upon the street railway business of the country, certainly not in the interior. It might in certain localities, as some sea coast city might be bombarded by a Spanish man of war. But this is not at all probable, as the Spaniards will be kept too busy protecting their own coast and Cuba to annoy our country very much. In case of bombardment the interference would be quick as the motormen and conductors would immediately desire a little recreation in the country if shells were dropping in the city. Being so far from the sea shore, war would have no effect upon our road except to cause the president of the road, who is a member of Governor Mount's staff, to don his fighting clothes and give his services to the defence of the flag and the country's honor. While war is undesirable, and in details very horrible, I consider it worth all it will cost in money and lives, in maintaining the honor of our flag and the dignity of this great country. It would prevent other fighting ships from being blown up and our brave seamen murdered. From the humanitarian side it will be worth all it cost in stopping Spanish cruelty as now practiced in Cuba, and would permit thousands of men, women and children to once more earn a living as God intended. Policemen in cities prevent outrages of the strong upon the weak and exert their power to preserve good order among all classes. This nation has a similar duty to perform in stopping the outrages by a cruel and decaying nation of the Old World upon the population of the Island of Cuba, an island that should and must be free."

The manager of an extensive system in the west: "Should we have war, in my judgment it will greatly embarrass the extension of lines and all new work, as there is a very strong probability of money rates being advanced, and of course this will have the effect of making it hard to sell bonds or raise money for new things. If the war, however, is of short duration it ought not to affect our regular business. We notice in the west already that there is considerable fear of the probable result, but, in my judgment, our line of business would not be near so much affected as others."

#### TROLLEY CARS ON BROOKLYN BRIDGE.

Since the trolley cars began crossing the Brooklyn bridge there has been a noticeable falling off of bridge receipts. This has amounted to about \$1,000 a day, which will leave a considerable deficit to be paid by taxation. Last year the bridge earned \$1,235,000, which was \$200,000 more than its expenses. The patronage given the trolley cars causes a large reduction in the receipts from the regular cable cars. Both the Brooklyn elevated roads and the ferries have suffered from the popularity of the trolley cars. On account of the diminished bridge receipts, it has been decided to decrease expenses by dismissing 50 trainmen.

A bill has been introduced into the New York Assembly instructing the Board of Railroad Commissioners to investigate and approve of some effective guards, fenders or sweeps for electric and cable cars. Street railway companies in all cities in the state over 60,000 shall provide the cars with such approved safety devices by January, 1899.

#### E. H. HARRISON.

E. H. Harrison, commander of the Naval Militia of Illinois, is well known to all the supply men of Chicago and a large number of street railway men in the West. In '93 Mr. Harrison was a member of the firm of Harrison & Cary, handling street railway supplies. When the firm was dissolved he went to Peoria as manager of the Spirits Company there, which position he now holds. He is a graduate of Annapolis, cruised in the Pensacola during the Chilean troubles, and can be depended on to command the Naval Militia with credit to himself and the state of Illinois. He



E. H. HARRISON.

is a brother of Hugh Harrison, of the J. G. White Company, New York.

#### MEETING OF THE ACCOUNTANTS' ASSOCIATION.

President Wilson and Secretary Brockway of the Street Railway Accountants' Association of America, have issued a circular of announcement to the membership giving the details of the convention in September so far as they have been arranged. The meetings will be held in the Banquet Hall of the Massachusetts Charitable Mechanics' Association Building, September 6, 7, 8 and 9.

Three of the papers to be presented have been decided upon; these are:

"Statistics—Their Use and Abuse."

"Car Mileage—How Arrived at and Its Use."

The report of the permanent committee on Standard Systems of Street Railway Accounting.

It is intended to make the exhibition of blanks and forms a feature of the meeting and it is earnestly urged that each member of the association be represented in this, in order that the exhibit may be complete, and as useful as possible.

The rapidly increasing scope and influence of the association is indicated by the application and admission to membership of the Honolulu Street Railway.

By direction of the management the motormen and conductors of the Metropolitan Street Railway, of New York, assumed their summer caps and suits on Easter.

M. T. Moloney, ex-attorney-general of Illinois, on March 30 purchased, for the amount of taxes due, the rolling stock of the street railway at Ottawa, Ill., which had been attached for unpaid personal property tax. Mr. Moloney sought to buy the road but could not make terms. He has leased the cars to the receiver of the road.



## THE GREAT FLOOD OF 1898.

Many Cities and Their Street Railways Inundated—Power Houses and Car Barns Do Not Escape—Fires Extinguished and Traffic Suspended—In Some Places Tracks Washed Away—Principal Losses, However, Are in Revenue.

Many towns and cities in Ohio and southern Illinois were inundated during the high water March 23 to April 4. The greatest catastrophe was at Shawneetown, Ill., on the Ohio river, where 30 persons lost their lives and the larger part of the town destroyed. The 25-ft. levee gave way so suddenly that little or no warning of danger was given to the inhabitants. No similar loss of life was recorded elsewhere, but the other damage was very great.

At Columbus, O., the levee guarding the west side broke and the city experienced the worst flood in its history. The accompanying illustrations convey a good idea of how the Scioto river ran riot over a portion of the city. The street

The bridges throughout the Licking valley were washed away and cut off all means of transportation around Newark, O. The power station of the Newark & Granville Electric Street Railway Company was under water and operation had to be suspended. The Tuscarawas river was higher than it has been in 50 years and much damage was done around New Philadelphia. The interurban line between Uhrichsville and New Philadelphia sustained damages to its roadbed to the extent of \$2,000 or more.

Miss Anna Mitchener, superintendent of the Tuscarawas electric line, distinguished herself during the flood. The electric line was badly crippled, more than two miles of the



THE FLOOD AT ZANESVILLE, O.

railway service was interrupted on some lines where the water was so deep as to flood the motors. On High street a lake formed 200 yds. wide which the cars could not cross and it was necessary to transfer passengers in busses. The water flowed into the wheel pits of the power station on West Spring street but pumps were put to work and the water kept pumped out until the river had fallen below the danger line. The two dynamo rooms of the Columbus Electric Light & Power Company were flooded and the engines and dynamos were covered by the water. A thorough overhauling and cleaning of the machinery is necessary and will entail a large expense.

The Ohio river was out of its banks and considerable damage was done around Cincinnati, Newport and Covington. The conditions were substantially the same as last year, a description and illustrations of the flooded districts being given in the REVIEW at that time. The patrons of the cars in Dayton and Bellevue, Ky., had to transfer from the cars into flat boats, draw themselves across the ponds by a cable and again take the cars for Cincinnati.

13 being under water. While the flood was at its height, Miss Mitchener hired a livery horse, donned a waterproof habit and went without an escort to the scene of the wash-out, where she personally directed the work of the employes of the line in guarding the railway property against damage. She then pushed through water half way up on the horse's side, rode to Uhrichsville, and, without dismounting, returned over the route the same day, making a total of 26 miles.

The road ran its cars through to Uhrichsville after several day's delay and the speedy resumption is due to the pluck and good management of the fair superintendent. Her father, Major E. C. Mitchener, wired his congratulations.

At Wheeling, W. Va., the water covered the floors of the power station and car barn. The cars were removed to a part of the city where there was no danger from the flood. It also became necessary to shut down the station and lift the generators off the foundations and support them on ties 6 ft. above the floor. By this course no damage to the ma-



Y BRIDGE AT ZANESVILLE, O.

chines was sustained. The lines of the Moundville, Benwood & Wheeling Railway Company were submerged and the cars operated on portions only of the route for a few days.

At Evansville, Ind., the river rose to 44.8 ft. and threatened the station of the street railroad company. The Miami Valley Traction Company, of Hamilton, O., suffered severe loss, its roadbed was swept away in numerous places and the damage cannot be repaired for some time. The flooded condition of the streets in Marion, O., caused a delay on some of the lines of the Marion Street Railway Company. The pits in the car barn were also flooded.

In reference to the flood General Manager Nelson, of the Springfield (O.) Railway Company, says:

"We suffered considerable loss and damage from the recent high water. The levee along Buck creek, above our power house, gave way and caused our premises to overflow. In fact there was about 2 ft. of water in our car barn and repair shop, and about 6 in. over the power house floor. This break occurred after shutting down time at night, and as we were expecting it, our belts were removed and machinery generally put above any height the water might possibly attain. We were, however, unable to start our machinery until 11 a. m., on March 23, and therefore suffered practically the loss of one-half day's business. It was impossible to get to or from our power house from about 2 a. m. until noon. We had a number of poles carried away and some track washed out, also two large oil storage tanks."

Zanesville, O., suffered much damage from the high water and the following account is from General Manager Westcott, of the Zanesville Railway & Electric Company:

"After a rain of four days, the Muskingum and Licking rivers, which join at the Y bridge, were so high they commenced overflowing their banks on Wednesday, March 23, in the morning, and by 11 a. m. had covered our Gant Park line to the depth of 2 ft., submerging about 200 acres of the 7th ward and driving 500 families from their homes. By 2 p. m. the water had risen, covering our Brighton line to a depth of 3 ft. in places, giving us some two miles of track which was out of use, all other portions of the line being in working condition, clear of high water. During the evening, the water got up to the power house, and began running into the cellar, but we finished the day without any interruption at the power plant. At 5 a. m. Thursday, March 24, the water had risen so high in the power house that it could not be operated, and no power was generated until Sunday morning, March 26.

"No damage was done to power house or tracks but the steam railroads were not so fortunate, as all roads entering the city were tied up for several days, with washouts, and bridges gone. The Baltimore & Ohio Railroad, Cleveland, Canton & Southern Railroad, the Zanesville & Ohio River Railroad, and the Cleveland, Akron & Columbus Railroad suffered the greatest damage, and were several days without trains; the Cincinnati & Muskingum Valley Railroad, the Columbus, Sandusky & Hocking Railroad and the Bellaire,



SCENES NEAR HARTFORD AND BROAD STREETS, COLUMBUS.



Zanesville & Cincinnati Railroad all suffered great damage from the water in this city.

"Practically the whole of the 8th ward, as shown beyond the 'Y' bridge in the picture, was under from 6 ft. to 10 ft. of water, also about half the 7th ward. Part of the 2nd ward and part of the 9th ward were under from 3 ft. to 8 ft. of



COLUMBUS ELECTRIC LIGHT PLANT.

water, in all about 2,000 houses were practically half under water. Great suffering was caused, and two lives lost. The Citizens' Committee raised a good quantity of money to aid sufferers, who were attended to promptly. The police force, assisted by a company of state troops from Battery C stationed here, did police duty, and there was no excitement or disturbance."

## A CHAPTER OF CASUALTIES.

On March 9 there was a collision on the Atlantic Highlands, Red Bank & Long Branch Electric Railway, between a construction car and one of the regular cars which resulted fatally to the motorman of the latter. The accident occurred on a piece of single track nearly opposite the old Monmouth Park gates. The construction car had been at the nearest turnout and the motorman thought he could reach the next one before the regular car was due and was running at high speed. The regular car was a trifle ahead of time and the two met head on; a heavy fog prevented the motormen seeing the approaching cars until it was too late to stop. No passengers were injured.

March 11 a passenger train on the Jersey Central struck a car of the Lansford & Tamaqua Street Railway at the Broad street crossing in Tamaqua, Pa. The front of the car was demolished, but no one injured except the motorman, who sustained severe cuts about the head. It is stated that the motorman was unable to stop his car on approaching the crossing and finding the safety gates closed because of the failure of the brakes to work properly.

On the same day a serious drawbridge accident was narrowly averted at New Brunswick, N. J. A car on the Brunswick Traction Company's track approached the bridge spanning the Delaware & Raritan Canal and because of the fog he failed to see that the draw was open until quite close.

When close enough to see the danger the brakes were applied, but the car coasted over the wet rails and was only prevented from plunging into the water by the guard chain stretched across the track.

March 13 there was a rear end collision between two trolley cars of the Consolidated Traction Company in Newark, N. J., in which several persons were injured, two quite seriously. The same evening a drawbridge across the Passaic river on the line between Newark and Harrison was opened as an electric car was running onto it and the passengers had a narrow escape; in this case the car had been signalled to come ahead by the gate tender.

A very unfortunate accident occurred at Racine, Wis., on March 31. The Milwaukee, Racine & Kenosha here uses the tracks of the Belle City Street Railway, which at one point cross a bridge over the Root river, which bridge is continued at one end as a viaduct over railroad tracks. Shortly after noon some boys were playing about the viaduct when a locomotive passed underneath; the smoke and steam rising through the cracks in the flooring concealed an approaching interurban car from the boys, and also hid them from the motorman. One of the boys, being on the car track, was struck and killed, the wheels passing over his body longitudinally.

## THE WAGE QUESTION IN GALVESTON, TEX.

The Galveston (Tex.) City Railroad Company is in the hands of a receiver appointed by the United States Circuit Court. Recently the employes petitioned the court to order an increase in the wages of the trainmen, and claimed that the surplus accumulated by the receiver since his appointment fully justified such an increase. The answer of the receiver showed that after deducting the interest on the first mortgage bonds and the floating indebtedness, there would remain, from the operation of the road for 12 months, a profit of but \$10,574; and that the extraordinary expenses, for material only, needed to improve the property amounted to \$46,000, which is greatly in excess of the surplus on hand and the profits to be expected from operation. He further said that the wages paid the company's employes were, with but one exception, as high or higher than the wages paid employes for similar work in any part of that section of the country. The rates are 14 cents per hour for the first year and 15 cents thereafter; an increase of 2 cents was asked.

The court denied the petition because of the condition of the property.

## RIGHTS IN THE HIGHWAY.

In a case now pending in the Pennsylvania courts between the Pennsylvania Canal Company and the Lewisburg, Milton & Watsonstown Street Railway Company the Canal Company sought to enjoin the street railway from crossing the canal on an overhead bridge near Watsonstown. In the lower court it was held that as the public road crosses on the bridge, the street railway also had a right to its use. An appeal has been taken to the supreme court.

The Northampton (Mass.) Street Railway Company has closed a contract with the postal authorities to carry the mail between Center and Bay State three times a day.

## PROSPERITY AMONG THE STREET RAILWAYS.

Reports From 30 Representative Roads Reflect Improved Conditions in all Sections of the Country—Highly Gratifying Increase in Earnings for First Quarter of '98—Industrial Activity Reflected in These Figures and the Outlook Is Universally "Good."

The REVIEW was not one of those who on the morning of November 4, 1896, went out upon the house tops to see the sun of prosperity rise and in a single day dispel the mists which had obscured the business horizon for over three years; many of those who did go out remained and their over-taxed eyes could not recognize the steady but gradual improvement in conditions which the last year has brought about—things appeared distorted and they earned the name of "calamity howlers." We believed that any lasting improvement in business must be of gradual growth—the result of united effort which would be made when the silver bogie was muzzled—and awaited the future with confidence. During 1897 the volume of trade in general was large, any dissatisfaction which was felt being due to the fact that the prices prevailing were low. It would be difficult indeed to find a series of predictions for the future more sanguine in tone than those of our advertisers which were published in "Echoes from the Trade" in our issue of December last; and they were justified by the statement of the year's business.

Looking, as we did, for the better times in 1898, it is with great satisfaction that we are enabled to give below the reports from a number of street railways which are so much better than expected as to be surprising. In all the northern states the street railways find that the last quarter of the year is very much better than the first quarter; this is because in our climate the bad weather of the year is for the most part crowded into the months of January, February and March, and the effect of what little of winter comes in December is more than counterbalanced by the holiday traffic during that month. The manager of a street railway, therefore, when looking over the statement for the first quarter of the year is usually much gratified if the decrease as compared with the previous quarter is not a great one. An absolute increase in the receipts of the first quarter over the last is not to be thought of, except in one's dreams, as a general thing.

The street railways are good barometers to indicate the state of the business atmosphere, and this is especially true of manufacturing centers. If a man is out of employment he has no use for a street car, and his family can not afford to ride. There is also a large class of people who, when driven to economize, find that street car fare costs more than shoe leather, and walk where in better times they would ride. The statements given below are indicative therefore of prosperity for us all.

The receipts of the Cleveland, Painesville & Eastern Railroad for January and February, 1898, were 20 per cent greater than for the same months in 1897. This company has built 14 miles of track in the last six months which is not yet in operation. The outlook is reported as good.

The Nassau Electric Railroad, of Brooklyn, which is an interurban as well as a city line, reports that the receipts for the first quarter of this year were 25.25 per cent above the same months in 1897, and that they were 10.71 per cent in excess of the last quarter of 1897. In anticipation of the

summer traffic the company has secured 120 new cars and increased the capacity of its power plant by 2,500 h. p.

The Springfield Railway Company, of Springfield, O., a city line, reports an increase in receipts for the quarter just closed of 24.90 per cent over the first quarter, and 5.75 per cent over the last quarter of 1897. Compared with the corresponding months of 1897 the increase was: January, 28 per cent; February, 22.5 per cent; March, 24.25 per cent. The prospects are good. The general manager, Samuel L. Nelson, writes: "Our industries are all in operation and with orders on hand sufficient to keep them going for several months. Practically all our idle labor has been employed, there being no skilled labor whatever unemployed. Empty houses are filling up and the general outlook has not been so good since 1892."

The Market Street Railway Company, of San Francisco, earned nearly 7 per cent more during the first quarter of 1898 than during the first quarter of 1897. General Manager Vining states that while the prospects for the summer are good there is a danger of a dry season in California which would have an unfavorable effect on all lines of business.

The receipts of the Toledo Traction Company from its street railway for the months of January and February were 12 per cent in excess of those for the corresponding months of 1897 and the prospect is reported as good for the summer.

The Schnylkill Valley Traction Company, which operates both city and interurban lines, reports an increase for the quarter of 12.5 per cent over the first and .5 per cent over the last quarter of 1897.

J. P. E. Clark, general manager of the Binghamton (N. Y.) Railroad Company, writes: "I am pleased to state that the passenger receipts for the months of January, February and March have shown an increase of about 16 per cent over the corresponding months of the year previous; and in fact the last three months of 1897 show about the same ratio of gain over the corresponding months of 1896. I think the outlook for a large increased traffic the coming summer is most favorable, and in accordance therewith we are arranging our plans for the transportation of the expected increased number of passengers, and with that end in view, we are adding a 250-h. p. engine and a new dynamo to our present station equipment. We shall also add to our rolling stock, and shall place our entire equipment in a first-class condition."

The Third Avenue Railroad Company, of New York, reports an increase of 3 per cent for the quarter just closed over the first quarter of 1897.

The Chattanooga (Tenn.) Electric Railway Company, operating both city and interurban lines, reports the increase in receipts for the first quarter of 1898 as 7.5 per cent over those for the same months last year. The prospect for the summer is good.

The Fort Worth (Tex.) Street Railway makes a most gratifying showing; the increase in receipts for the first



quarter of this year is 25 per cent over the first and 15 per cent over the last quarter of 1897; the prospect for the summer is reported as very good.

At Toronto, Canada, the same prosperous condition obtains. The earnings of the Toronto Railway Company from January 1 to March 23, were 16.5 per cent greater than for the same period in 1897, and the decrease when compared with the last three months of last year, which were exceptionally good, was only 6 per cent. The prospect for summer business is good.

The Columbus (O.) Street Railway Company reports that its receipts for the quarter just past are 11.5 per cent in excess of those for the same months of 1897 and are practically the same as the last quarter of 1897, the difference being too slight to mention. The outlook is good.

Miller Elliott, superintendent of the Citizens' Street Railway Company, of Indianapolis, is quoted as follows: "I believe there is an apparent improvement in general business circles. Traffic is quite heavy now, in fact, our 6 o'clock passengers demand more cars. I think the wage-earner is realizing more income now for the reason that he, as well as the employer, believes that there is a more prosperous season upon us and if we can all work in harmony I am sure there will be little cause for any complaint, as far as hard times are concerned."

The gross earnings of the United Traction Company, Reading, Pa., which operates 48 miles of road, for February were \$11,307, a gain of \$729 over the same weeks of last year.

The report of the Brooklyn Rapid Transit Company's system for March, 1898, shows passenger earnings of \$449,938, an increase of 15.2 per cent over March, 1897, and of 21 per cent over March, 1896.

The Charleston (S. C.) City Railway Company, which operates city lines only, reports receipts as follows: Increase over 1897: January, 34 per cent; February, 10.2 per cent; March, 32 per cent. Increase over 1896: October, 30 per cent; November, 29.4 per cent; December, 40 per cent. The gross receipts for the first quarter of 1898 were \$36,880, and for the last quarter of 1897, \$40,435. The prospect for the summer is stated to be good, if we do not have war. This system was operated by horses until July 1, 1897.

The following is a statement of the daily increase of each of the St. Louis roads for the last quarter of 1897 as compared with the last quarter of 1896. The same increase continued in January; if the gain is maintained throughout the year the increase for the St. Louis lines will be \$239,000 during 1898.

Cass Avenue & Fair Grounds Railroad.....	\$ 14.74
Citizens' Railway Company .....	34.92
Lindell Railway Company .....	155.78
People's Railroad Company .....	2.55
Missouri Railroad Company (Olive street).....	80.09
St. Louis Railroad Company (Broadway Cable).....	48.30
St. Louis & Suburban Railway Company.....	119.40
Southern Electric Railroad Company.....	24.38
Union Depot Railroad Company.....	179.06
<hr/>	
Total daily increase, all lines.....	\$663.95

Speaking of the increase in receipts shown by this table, C. H. Spencer, president of the Southern Electric Railway Company, said: "The January earnings of every road in town showed an increase over the corresponding month of last year, and if I am correctly informed, it breaks all rec-

ords. This is not a mere spurt on the part of one road for a single month, or of all the roads for a month; it has been the same for four months. October, November and December, as well as January, all show handsome increases, so that it cannot be credited to any unusual conditions of weather or anything of that sort. It shows that the people have found employment, that there is money in circulation, that the crops of the country have brought good returns to the farmers and that country merchants are getting their money for their goods and are paying the wholesalers in the cities for what they bought from them. The wholesalers in turn are paying the manufacturers, and every branch of trade is flourishing. It is not a local condition, but seems to be general throughout the country."

Reports have been received from several companies which for various reasons do not care to be quoted, but with a single exception they are of the same tenor, showing increased receipts and stating the outlook to be good. These reports in detail are:

1. This is the exception. It is an 8-mile city road which has but recently emerged from the purifying hands of a receiver. The receipts for the first quarter of this year were \$474.46 less than for the same period of last year.

2. A city and interurban road with 25 miles of track. The increase in receipts over the corresponding month of 1897 were: January, 26 per cent; February, 18 per cent; March, 16 per cent. Prospect very encouraging.

3. A city and interurban line with 35 miles of track. Receipts for first quarter of 1898 17.7 per cent in excess of the first quarter of 1897. The general manager writes that the company is building a few miles of new track and states that if the war scare subsides there will be a very much better business than last year.

4. City line, 160 miles. Increase of receipts for first quarter of 1898 over first quarter of 1897, 10 per cent; decrease as compared with preceding quarter, 6.3 per cent.

5. City road, 42 miles of track. Increase of receipts for first quarter of this year over first quarter of 1897, about 10 per cent; over last quarter of 1897, about 15 per cent.

6. A city and interurban line. Increase of receipts for first quarter of 1898 as compared with first quarter of 1897, is between 8 and 9 per cent.

7. A city road with 50 miles of track. Increase for the quarter, compared with first quarter of 1897, is 6 per cent.

## A HARD FOUGHT CASE.

For the fourth time a new trial has been granted in the case of Mrs. Macy Beaupre vs. the Citizens Street Railroad Company, of Indianapolis. The plaintiff claimed to have been very seriously injured in January, 1896, when attempting to alight from one of the defendant's cars; she alleged that she was dragged for 150 ft. The testimony in the case was very conflicting, and it is claimed that many of the plaintiff's witnesses perjured themselves. The four trials resulted as follows: First, disagreement; second, \$3,500 for plaintiff; third, \$15,000; fourth, \$2,500.

An eastern paper tells of a banker who at the request of a client investigated a Kansas street railway to discover why the dividends were not up to the standard, and received this reply: "The free and unlimited coinage of bicycles has taken all the profit out of our business."

# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

Experiments made by Prof. W. L. Hooper, of Tufts College, to determine the temperature of four General Electric wattmeters show that for each degree, Centigrade rise of temperature the constant of the instrument decreases about one-twentieth of 1 per cent.

\* \* \*

In the Journal of the Franklin Institute for March is the report of a committee which tested the Arndt "econometer" for continuously indicating the percentage of carbonic acid gas present in the furnace gases, and thus giving a check on the manner of firing the boilers. This instrument was illustrated in the REVIEW, June, 1897, page 390. The test was conducted at the Baldwin Locomotive Works, the instrument readings being compared with the results of analyses of the gases made by Prof. Harry F. Keller. The report says: "These comparative tests satisfied the investigating committee as to the substantial accuracy of this instrument. The recorded variations given in the annexed tables show discrepancies so trifling that, if the econometer were used in the management of steam-boiler furnace fires, no considerable loss would occur by reason of the difference between the econometer reading and the chemical analysis. A saving in fuel would result because of a better and more intelligent management of fire and damper, allowing less surplus air to pass through the furnace than would ordinarily be the case."

The per cent of C O<sub>2</sub> by analysis, and by the econometer during the time the sample gas for analysis was being drawn out are as follows:

Analysis . . . . .	4.02	4.84	4.12	9.06	10.53	6.57	4.38
Econometer . . . . .	3.80	4.70	3.93	8.57	10.40	6.90	4.40

\* \* \*

C. C. Brown in "Municipal Engineering," March, 1898, in answer to a correspondent gives some data as to the cost of operating pumping stations in four cities; it is stated that the data are "from a table in preparation." The costs were given per 1,000,000 gallons pumped 100 ft. high.

City.	Capacity, Gals. per Day.	Cost per 1,000,000 Gals 100 Ft. High, Dollars.				
		Fuel.	Labor.	Oil, etc.	Repairs	Total.
1. Chicago.....	99,000,000	3.61	1.97	.12	.12	5.82
2. Milwaukee.....	35,000,000	1.00	1.44	.12	.08	2.64
3. Newark, N. J.....	26,000,000	1.86	1.72	.35	.27	4.20
4. Milwaukee.....	9,000,000	2.53	5.39	1.05	.47	9.24
5. Mankato, Minn.....	3,100,000	3.37	2.48	.16	.60	6.61

For the purpose of comparison with the power house costs published in the REVIEW, these pumping plant figures have been reduced to per kilowatt-hour at the switchboard. The kilowatt-hour is equal to 2,654,432 ft.-lbs.; the pumping

unit, 1,000,000 gal. 100 ft. high is equal to 833,900,000 ft.-lbs.; the pumping unit is therefore equal to 314.15 k. w. h.

City.	Capacity, Gals. per Day.	Cost per 2,654,432 Ft.-Lbs. (k. w. h.) Cents.				
		Fuel.	Labor.	Oil, etc.	Repairs	Total.
1. Chicago.....	99,000,000	1.149	.627	.058	.038	18.52
2. Milwaukee.....	35,000,000	.318	.458	.038	.025	.840
3. Newark, N. J.....	26,000,000	.592	.548	.111	.086	1.337
4. Milwaukee.....	9,000,000	.805	1.716	.334	.150	3.005
5. Mankato, Minn.....	3,100,000	1.673	.789	.051	.191	2.104

We have always been told that the steam plants of maximum economy were pumping plants because the load is constant, and the reduction of costs to the k. w. h. basis was made in order to see how far below the pumping plants the street railway plants would fall as regards economy of operation. The results were a genuine surprise to the writer as they will no doubt be to the most of our readers. By reference to the table, "Cost of Power for Electric Railways," on another page, it will be seen that the only pumping station showing a cost anywhere near as low as these street railway stations is the 35,000,000-gallon plant at Milwaukee. The engines in this station are the ones tested by Prof. R. C. Carpenter in March, 1893, when the water rate of 11.68 lbs. per i. h. p. per hour was obtained. The cost of operation of this station is above that of five of the street railway stations given, and not very much below three of the others.

There may be factors to be considered in connection with the pumping station data which we have overlooked, because not given in Mr. Brown's table, that would explain these high costs, and if so we should be very glad to have them brought to our notice.

\* \* \*

According to an account published by the inventor of the system, the best way to secure an efficient combustion under steam boilers is to close the openings ordinarily provided for the supply of air and draw the air down the chimney. As we understand it a comparatively short section of pipe of a diameter somewhat smaller than the stack is placed at the top, and projects a short distance above the stack; the hot gases find a way out through the interior of this pipe and cold air enters the annular space between the pipe and stack. The cold air flows down close to the walls of the chimney while the hot gases flow up in the center; on reaching the boiler the air flows through lower fire tubes to the rear end, and back underneath to the furnace; the gases resulting from combustion pass through the upper tubes.

The results of tests of this system are quoted which show gains of from 4.5 to 31 per cent over furnaces of the ordinary design.



The advantages claimed for the system are:

1. A saving is made by heating the air by contact with products of combustion after they have passed the sphere of useful work, instead of heating the air at the expense of the fuel.
2. A saving is made by feeding air heated by the products of combustion on top of the fire in automatically regulated quantities.
3. A saving is made by excluding the large amount of surplus air fed through the grate bars in ordinary practice.
4. Hydro-carbons and other combustible gases, which frequently escape before they are consumed for lack of oxygen, are wholly consumed in the combustion chamber.

It is probable also that by taking the air (which to flow down the chimney in the path marked out for it must be somewhat cooler than the waste gases) through the lower tubes, this portion of the boiler will be prevented from becoming overheated, though this is not claimed by the inventor.

\* \* \*

Last month we called attention to the steam consumption of the auxiliary apparatus in the power station of the Chicago storage battery road, which showed over 19 per cent of the total steam generated was used for that purpose. Such a figure is by no means unusual in the operation of other power plants using steam driven auxiliaries and the paper by Past Assistant Engineer W. W. White, read before the American Society of Naval Engineers, shows that the same conditions obtain on shipboard. Whether it would be practicable and safe to substitute electric motors for the steam pumps and blowers, and concentrate the electric plant is a question. But the presentation of such data as Mr. White gives in his paper will serve to call more attention to the subject, which is of particular importance on board naval vessels where any apparatus that wastes coal detracts appreciably from the power of the ship. The following is an abstract of the paper in question:

**Steam Consumption of the Auxiliary Apparatus of the U. S. S. "Minneapolis."**

The apparatus for testing the auxiliaries was primarily arranged to find the steam consumption of the dynamo engines. From an inspection of the cylinders it was known that these engines used an abnormally large amount of steam, due to leakage past the pistons which were grooved for water packing, and were without packing rings. New pistons with snap rings were designed and fitted in the cylinders of one of the three dynamo engines, and tests were made to ascertain whether the saving was sufficient to warrant the change in the remaining two. The method adopted in all experiments was to measure volumetrically the condensed exhaust steam in barrels provided for that purpose, the temperature being observed and the weight of the water derived from these observations and sample weighings. No attempt was made to specially prepare any auxiliary for testing. All were periodically examined and repaired, as found necessary, and thus kept in good condition. The tests were made as opportunity offered and with the auxiliary doing the service work required aboard ship. Indicator cards were taken during the different tests.

The electric lighting plant consists of three 24-k. w. generating sets constructed by the General Electric Company, Schenectady, N. Y. Each dynamo, which is compound

wound of the multipolar type, is driven by a two-cylinder, simple vertical inverted engine, the crank shaft being coupled direct to the armature shaft, and the bed plate common to both engine and dynamo. The designed speed of each engine is 400 revolutions with 80 lbs. steam pressure, the maximum output being 300 amperes at 80 volts. There is, however, considerable reserve allowed for in the design, and the engines are capable of a much higher power than that necessary to produce the output mentioned.

The engine cranks are set at an angle of 180°, and one eccentric, working through a rock shaft, furnishes motion to drive both valves, one for each cylinder. These valves are of the piston type without packing rings, one supplying steam at its ends, and the other in the middle. An automatic shaft governor regulates the angular advance of the eccentric, and tends to keep the speed constant with a variable load.

The valves are placed on the fronts of the cylinders, and the valve chests and cylinders are in one casting. The pistons, which are intended to be a neat fit to the cylinders, have three circumferential grooves for water packing. An examination of the cylinders, pistons and valves, preliminary to testing, showed the following results:

No. 1 Dynamo.—Both cylinders considerably eroded near middle of stroke, for about one-half the circumference, due to constant blowing of steam past the pistons; pistons a bad fit to cylinder bores. Forward valve a loose fit, after one fairly tight.

No. 2 Dynamo.—Cylinders slightly pitted and rusty, except about one-third of the circumference; pistons a closer fit than No. 1, but steam evidently blows past both pistons. Forward valves a fair fit, after loose and leaks.

No. 3 Dynamo.—Cylinders in fair condition and pistons a good working fit. Forward valve loose and top bridge piece between ports rusty from leakage of steam; after valve a fairly good fit.

As before mentioned, one new set of pistons with spring rings was cast, and these substituted at different times for the water-packed pistons in all three dynamo engines. To determine what saving resulted, a test was made of each engine before and after the change.

All tests were made with the dynamos doing the ordinary lighting of the ship. Usually one dynamo was sufficient for this, and in the absence of any special reason it was the rule to change from one to another in regular order every twelve hours.

A reducing valve and a separator are located in the dynamo room; the piping is so arranged that steam, before its admission to the cylinders of any of the engines in use, passes through both.

Tests made on No. 1 engine with and without new pistons and spring packing rings showed an average steam consumption per indicated h. p. hour with water-packed pistons of 123 lbs. and with pistons fitted with spring rings of 60 lbs., the load varying from one-half to full load and averaging about two-thirds load in each case. This great difference in the steam consumption would amount in a 24-hour run at this load to over 16,000 lbs. of steam, or, assuming a boiler efficiency of 1 lb. of coal per 7.75 lbs. of water, the difference in coal consumption would be over 2,000 pounds. Tests on one of the other dynamo engines fitted with pistons grooved for water packing showed an average steam consumption per i. h. p. per hour of 109 lbs., with the dynamo

# Street Railway Review

COST OF POWER FOR ELECTRIC RAILWAYS.  
Output Measured by Wattmeter in Each Case.

STATION.	MONTH.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel. per k. w. h.	Price of Fuel per Ton of 2,000 Lbs.	Kind of Fuel	
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.	Total.							
1.....	Jan.	1,361,882	.313	.166	.029	.029	.052	.589	3.5	.8	9.6	2.97	\$2.11	Bituminous.	
2.....	"	140,988	.499	.347	.168	.....	.063	.977	5.63	7.41	7.05	4.16	2.40	"	
3.....	"	302,440	.444	.200	.036	.....	.014	.705	4.13	6.28	.....	4.17	2.13	"	
4.....	"	386,925	.344	.163	.027	.....	.002	.....	5.36	4.8	.....	3.19	2.16	"	
5. Metropolitan Elevated, Chicago.	"	1,813,125	.354	.139	.020	.....	.019	.063	.595	6.2	5.20	3.77	.....	.....	
6.....	"	565,580	.696	.235	.073	.....	.087	1.091	.....	.....	.....	2.54	.....	Oil.	
10. Metropolitan, Kansas City, Mo., Central Av.	"	339,516	.328	.133	.012	.....	.004	.009	.488*	1.9	2.09	.....	5.307	1.20 to 1.40	"

\* Miscellaneous, .002

loaded to about half its rated load, and 84 lbs. per i. h. p. hour with the dynamo loaded to about 15 per cent overload. The same engine fitted with new pistons with spring rings showed steam consumptions of 65 lbs. per i. h. p. per hour, on tests made at slightly over half load. The saving on the third engine was also considerable, although not as great as on the other two. Unfortunately, the steam consumption per electrical horse-power output was not derived, as the instruments for measuring the output were not sufficiently accurate.

While these steam consumptions seem to be considerably greater than they should be, the steam consumption of some of the other auxiliaries was still more serious.

The following table shows the indicated horse-power and steam per indicated horse-power of some of these auxiliaries:

Name of Auxiliary.	I. H. P.	Steam per I. H. P. H. Lbs.
Pump of starboard condenser.....	1.23	266
Circulating pump engine (fly wheel).....	.19	55
Starboard air pump.....	6.5	183
Center air pump.....	.25	78
Vertical duplex fire pump.....	1.	205
Horizontal duplex fire pump.....	0.8	319
Same pump.....	6.4	156
Vertical duplex bilge pump.....	2.5	171
Fire room feed pump (vertical duplex).....	8.8	91
Same pump.....	1.6	243
Forced draft blower engine (fly wheel).....	.16	77
Single cylinder horizontal flushing pump.....	1.4	194
Air ice machine.....	6.	70

Tests made of the relative amounts of steam consumed by the main and all the auxiliary engines on a run made between Gibraltar and League Island, Pa., showed that the main engines used about 33,600 pounds of steam per hour and all the auxiliaries about 10,000 pounds per hour. In other words, over 23 per cent of the steam generated was required by the auxiliary engines.

Some additional equipment has been placed in the repair shop of the Metropolitan West Side Elevated Railroad Company, of Chicago. A 16-in. table saw has been put in and a 48-in. boring machine. In the new equipments of motors and trucks the axles have been increased from 4¾ in. to 5¼ in. and the hubs of some of the wheels had to be bored out.

## THE ELECTRIC RAILWAY.

(Abstract of a Paper Read before the Chicago Electrical Association by W. R. Garton.)

The electric railway is today one of the greatest moral and financial powers; from its infancy it moved the public, and it still continues to do so, and to no small degree either, for it is fast superseding every other method of transportation. As a moral power and influence its effect is wonderful. It has raised the mule and horse car drivers to motormen, who in most instances must know something more than to handle a whip and a brake handle. It elevates its patrons by giving them opportunities of rapid transit at low rates, enabling them to live at a distance, own their own homes, thus encouraging thrift and industry. It also has the effect of inspiring to higher and better positions, from the very fact that the man who has been enabled to begin payment on a home naturally wants better wages. It has placed thousands of men, who prior to its advent were ordinary, thoughtless, careless groomers or foremen of horse barns, etc., in positions of honor and responsibility, and it has developed in those men the once dormant talents, thus causing them to respect their positions, their superiors and themselves. What greater influence for the betterment and elevation of mankind could we ask for?

As a ruling influence in the financial world—is it not true that wherever it goes it enhances the value of property? Does it not raise the price of real estate, and is it not known to every one that many a dwarfed community, suburb town or village has by its influence sprung into prominence as a manufacturing center, or as a much desired living place for the city business man? Has it not in just this way materially changed the value of the once valueless property, now a handsome and much esteemed home?

The electric railway, like all other great movements, must fight its battles, but very often its most bitter opponents come to be its strongest advocates. At first the electric railway was very skeptically looked upon from the very fact that it was a new thing, the practicability of which had to be proven, other electrical apparatus at that time being quite a novelty to the general public. It is well remembered the excitement and curiosity occasioned by the first car on our early systems but, as usual, the novelty soon wore away, and the electric railway was soon a commonplace thing.

The electrical man, however, has not from that time until now been content to look upon it as other than a great field for improvement and investigation.

Van Depoele is looked upon as the man who incorporated the necessary principals to make it lasting, practical and commercial. Benson Bidwell, now of this city, however, claims to be the father of the electric railway, having operated a car on the lake front in 1887, also having had in operation an electrically heated, lighted and propelled car at the exposition at Philadelphia in 1884. It was not until after the absorption of the Van Depoele patents, etc., by the Thomson-Houston Company that it assumed any considerable prominence.



About this time many other railway systems came into prominence, such as the Spragne, Short, etc. Aside from these three, there were many others, one that became quite popular was the Rae. All of these motors were electrically very efficient, but were mechanically inferior and expensive to maintain. It would, however, be grossly wrong if we did not give them much credit.

The T. H. and Sprague motors, while in some respects being constructed upon the same general principles, were essentially and radically different in others, as, for instance, in the manner of control. The T. H. motors were controlled by means of an external resistance, aside from a small portion of the field spool being so arranged as to be cut out on the last point.

This portion of the field was termed the loop, the direction was controlled by means of a three-point switch, known as the reverse switch, both the rheostat and reverse switch were manipulated by means of flexible cables, sprocket wheels and chains, the two controllers working in unison upon the same cables.

The Sprague system of control was that of the series-parallel, although not as we know it today. Each motor was provided with six field spools, each like set being constantly in series, that is, upper and lower spools were always in series with each other, and in so far as connections were concerned formed one field, two leads or terminals were run from each set of spools to a terminal box on the motor. The two motors always remained in multiple with each other, as was the case with the T. H., the change from series to series-parallel and finally to parallel taking place in the different field spools of both motors in unison. These changes were effected by means of cylinder controllers commutated in the same manner as those of today. This controller cylinder was divided into two parts, one for the forward motion, the other for the reverse. This was, of course, a very economical method of control, but it had its drawbacks. The Sprague or Edison No. 6 was a very powerful motor, but it was woefully deficient mechanically. The Rae system, while designed upon the same general principles, electrically, is in its general construction and arrangement very different. The principles laid down by Mr. Rae, I believe, are ideal had the mechanical difficulties been overcome. Mr. Rae's idea was to provide a powerful and an efficient motor equipment of few parts involving all the necessary principles and overcoming the defects in other systems. To do this, in the first place he provided one large motor of double the capacity of one T. H. or Edison motor, or equal to a complete double equipment of T. H. or Edison motors. The result from an electrical standpoint is at once obvious, he gained the combined strength of the two motors in one, which was always in harmony with itself and working uniformly on each axle. With a double motor equipment it is impossible to always have both motors doing equal duty, thus a dropping off in the efficiency of the equipment.

The tendency has been to reduce mechanical imperfections and to improve upon the electrical construction. Not only is this true of the motor, but also of the controller, as well as the method of control. The early motors were all double reduction, noisy and unprotected, the gears and bearings were open to dust, rain and mud, an accumulation of which shortened their life. These motors were bi-polar, the armatures were high speed and consequently gave maximum wear of the parts.

The first move to depart from the high speed motor was made in 1892. As I remember the first single reduction motor, the S. R. G. was first shown or introduced to the railway fraternity by the General Electric Company in October of that year. The S. R. G. was a modification of the F. 40 and looked much like it, with the exception of the absence of the intermediate gearing. From this on improvements came in rapid succession. The S. R. G. filled the requirements of a slow speed armature, consequently less gearing, less noise, less repairs, but still it lacked the armor to protect it from the weather and the accumulation of dust and dirt. To fill these requirements the W. P. was put upon the market, but it, like its predecessor, came but to be replaced by another, the G. E. 800.

Of course, there are many other motors upon the market equally as good as these mentioned, but, as they have all emanated from practically the same source, it is much easier to use them to illustrate the advance. This brings us up to the present with our highest development of electric railway equipment. We are to-

day not only in possession of high speed, high grade equipments, but also powerful motors for suburban and elevated service.

The electric locomotive is replacing the steam for heavy duty. Such as, for instance, the New York, New Haven & Hartford Railroad which is the longest section of any railroad in the world, hitherto exclusively operated by steam locomotives, to be equipped for electric traction. This system employs the third rail, the motor equipment consists of two G. E. 2,000 motors and style L controllers.

The Hoboken Shore road and the B. & O. tunnel road employ electric locomotives; they are mounted on two four-wheeled trucks, each axle carrying a G. E. 2,000 motor giving the locomotive a total of 540 rated h. p. the weight on the drives being 75,200 lbs. The draw bar pull is 10,000 lbs. Therefore, when we look back a few years and compare the 15 or even the 30-h. p. equipments which were then our best, with these monsters, does it not show marked progress?

Not only has the car equipment received so much careful consideration and been brought to so high a degree of perfection, but the entire system from the line to the power station shows the hand of the watchful and scrutinizing engineer. Consistent with the improvements in the propelling portion of the system, attention to the line and roadbed must needs have received equal consideration, otherwise the improvement in equipment and service would be entirely out of harmony.

In 1889 we used wood and canvass bell hangers supported by screw eyes, in 1892 the mica bell, then the well known cap and cone and at present the standard West End hanger; this last hanger incorporates all of the necessary and approved principles and qualifications. Mr. Henry, of Denver, suggests a cheap form of overhead construction by placing poles alternately on opposite sides of the street and running the span wires at an angle, thus decreasing the number of poles by one-half.

When the electric railway was first introduced, those introducing and installing it knew precious little more about it from a practical standpoint than the public. Quality of insulation, carrying capacity of conductors and the absolute necessity of a perfect and continuous metallic circuit had received practically no attention. The current was turned loose and allowed to wander back to the station as best it might.

A complete and well defined feeder system was not thought of, which is proved by the remark which a certain railway manager made in speaking of the successful operation of certain railway devices in connection with his system. He said, "What would you do when you reached the end of our line where I can lay the trolley wire upon the rail without throwing the circuit breaker at the station?" From this it will readily be seen that there was some considerable drop between the station and the terminus. Such things are to be found today only where communication with the outside world has been discontinued.

Our feeder systems are now as carefully calculated and laid out as the generator in the station or the motor under the car, but the perfection of the feeder system was not all that was necessary, the return or rail portion of the circuit is of as much import as any other part of the railway. It is remarkable to know how long it has taken the average railway man to fully recognize this important fact, and less than three years ago the electrician of a very large system remarked in the course of conversation, "I can't imagine why it is that I have such an enormous drop on my line." It was pointed out to him that he had some 18 or 20 feeders to carry the current out and was depending upon one No. 0 rail bond to bring it back. "Yes, but can't it come back on the gas and water mains?" The reply was, "Yes, it can." It did and the result you know, and to his sorrow he found out.

The T. H. Company began by using No. 0 copper rail bonds, while the Sprague or Edison and others used galvanized iron bonds, No. 6 being standard. Many roads were bonded with iron or copper, as the case might be, regardless of the size or duty of the system, but this bond question has been completely revolutionized, and the engineer is now as critical on this point as is possible. He not only wants to know the capacity of the bonds, the nature and method of its contact, but as well its construction and durability. He also wants to know with what success it has met in battling with Father Time, expansion and contraction, motion of joints, etc.

To show how well versed early railway engineers were, the following may serve. One of a number installing a certain system took his helper and a magneto and went out to test over some of the bonded joints, and to his satisfaction he found no drop. To-day such tests are made by means of very delicate and low reading instruments. By reference to a paper read before it is a solicitation by G. W. Know, electrical engineer of the Chicago City Railway last year, or to the articles in the STREET RAILWAY REVIEW of last year by Harold P. Brown, the high standard of rail bonding of to-day, is very apparent.

To keep pace with this wonderful improvement in the motor equipment and exterior portion of the system, it was, of course, necessary that the heart of the system should continually grow and develop with equal rapidity. No comparison is more striking than to visit a power station of the early '90's and then to inspect one of modern equipment. Our early stations were equipped with small high speed belt driven bi-polar units, while our most modern plants are provided with large direct connected slow speed multipolar machines, thus affording better regulation, high economy in operation, the absence of transmission losses, consequently a most economical basis of operation.

Although the standard of apparatus has steadily advanced, the remaining portion of the power house equipment has been kept on an equal footing, viz., the switchboard and accessories. There were not only in the old type of apparatus difficulties encountered in the maintenance and operation, but the operators of this age have with their improved power house and its complement of efficient boilers, engines and dynamos, found that without the installation of two very important features the pulse of the great system was caused to fluctuate wildly.

These two comparatively small members of the system are the automatic circuit breaker and the lightning arrester. In this particular the time element has certainly shown results. Formerly a short circuit or an excessive overload with the slow and exceedingly good natured fuse as a means of protection was the cause of many a gray hair and countless sleepless nights. The approach of a thunder storm thrilled the helpless superintendent or manager with a dread of his life, and not until the appearance of the promised sign, the rainbow, did he draw a natural, full, long breath, and feel that he was once more permitted to consider himself fortunate.

The switchboard which formerly was wood has given place to marble or marbled slate. We used to determine our voltage by means of a degree meter, but now we have magnificent direct reading illuminated dial instruments which are constructed on two well established lines; the first that of the permanent magnetic field with a spring set, the other with an electro-magnetic field and a gravity set. Our instruments today are certainly very superior and satisfactory.

We have almost exclusively confined our time and attention to the consideration of the trolley system. We are, however, compelled to consider the very promising storage battery railway. I will not in this paper undertake to go into a detailed comparison of the storage battery and trolley systems, but to those interested I would refer to the very interesting, complete and certainly gratifying and promising report of the test which will be found in the February number of the STREET RAILWAY REVIEW.

The success of the Chicago road has been so encouraging that one of the old horse car lines of New York is now operating several similar cars with a view to using the storage battery in preference to the underground trolley. Time is required to prove the true worth of the storage battery to the electric railway as an independent means of supply, the extremely heavy duty and trials of transportation are not at all favorable to the battery, though I would not predict any thing contrary to the success of this system.

To avoid the use of overhead conductors, especially in our large cities, has been not only the aim of the faithful city fathers, but as well that of many of our most prominent engineers. Time and again has it been all but an accomplished fact in the form of the underground trolley, but alas at the critical moment it was found wanting. The great difficulty has been to maintain the necessary insulation. To do this underground where subject to moisture due to atmospheric changes, without the aid of the wind or sun to say nothing of consequent dripping and drainage from the surface of the street, is certainly a task.

The General Electric Company has installed a system of this character in New York which has been in operation for about a year with some degree of success, but it is very doubtful if any system will ever become a competitor for the overhead trolley. Many different methods have been experimented with, such as compressed air, gas, and a combination of steam, gas or gasoline with a generator and motor all on the same truck.

Two of these locomotives which have gained considerable prominence are the Patton and the Hielmann. \* \* \* From the above it is plain that, although we consider our apparatus almost a work of art from a standpoint of attainment, the future has in store for us just as great possibilities as has been afforded in the past. Perfection is yet a great way off, therefore, let no one say there are not the opportunities there used to be. The Sprague multiple-unit railway system is most certainly a conspicuous milestone in the pathway of progress.

We have gone over the electric railway field almost from its inception to the present, and have briefly touched upon some points but have not been able to consider the comparative difference in the cost of operation and the methods employed in educating the men entrusted with the handling of the apparatus.

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## NEW FENDER ORDINANCE FOR CHICAGO.

September 27, 1897, the Chicago city council passed an ordinance providing that all street cars should be equipped with fenders of a form to be approved by the mayor and the commissioner of public works. This ordinance was signed by the mayor on October 2, 1897, and was to take effect 60 days later. March 28, 1898, the city's legal adviser rendered an opinion holding the ordinance to be invalid, because not sufficiently definite.

A new ordinance has been prepared and introduced in the council in which it has been attempted to remedy this defect, the ordinance reading: "Every person or corporation controlling, operating or owning any street railroad in the city of Chicago be and hereby is required to equip and provide each and every car used on such street railroad with fenders of steel and of the basket kind, which shall be substantially attached to the front end thereof so as to guard passengers and pedestrians from being injured or thrown under the wheels in case of collision or other accident."

In succeeding sections it is made unlawful to use or operate any cars not so equipped, the penalties for violation ranging from \$25 to \$100. June 1, 1898, is the time fixed for this ordinance to take effect.

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## WEATHER FORECASTS ON CARS.

At the suggestion of one of the observers of the local weather bureau at Rochester, N. Y., arrangements were made with chief of the bureau at Washington for a large supply of the weather cards and they are to be displayed in the street cars of the Rochester Railway Company. T. J. Nicholl, general manager of the company, was consulted and was heartily in favor of trying the experiment. On March 31 it was begun, the forecasts being displayed in 105 cars. The cards are placed at the right of the door, over the end window.

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The Metropolitan Street Railway Company, of Kansas City, Mo., gets its transfers in large numbers. Recently a consignment of 10,000,000 was received from a Philadelphia printing firm.

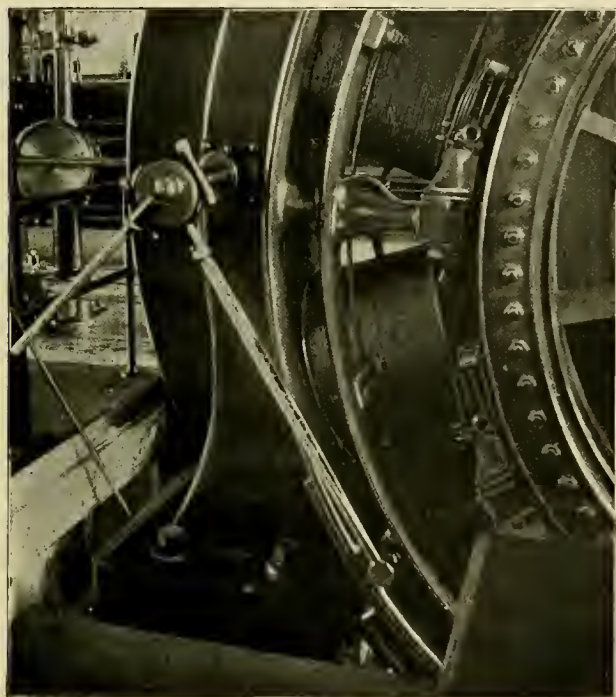


**SOME EXPEDIENTS IN POWER STATION PRACTICE.**

BY J. H. DE GRUCHY.

In power station practice it is expedient, to get the greatest efficiency, to run the generating units at as nearly full load as possible. With the machine fuses of sufficient carrying capacity to take care of temporary overloads, one must necessarily depend for protection upon the feeder circuit-breaker on the line upon which the trouble occurs. But if, as sometimes happens, short-circuits occur on two or more feeders at one time, the machine circuit-breakers are liable to be opened by the excessive overload put upon them.

Short-circuits are caused by broken trolley or feed wires, by trouble in the car equipments, and by foreign wires



DEVICE FOR ADJUSTING THE LEAD.

crossing the trolley wires and rails. These are the causes of short-circuits, which generally come singly.

Short-circuits produced by lightning, either from direct discharges or those dissipated over a larger area and generally due to induction, are liable to occur on two or more feeders at one time. Sometimes they are accompanied by a discharge through the machine lightning arresters.

Such occurrences sometimes happen during severe thunder storms. If the machine circuit-breakers are in proper working condition they will open the main circuit. Now suppose we have four dynamos running with a capacity of 4,000 amperes at 560 volts pressure. With the feeder circuit-breaker adjusted to open at 1,000 amperes, short-circuits on two of them, together with a flow of current to the ground through one of the machine lightning arresters, would undoubtedly open the machine circuit-breakers. With a heavy short-circuit, the current flowing during a rupture, before the circuit-breaker is fully opened, is often

considerably in excess of the amount called for by the adjustment.

Generator.	Current Amperes.	Circuit Breaker.	Adjusted to Open.
1 . . . . .	900	1	1,400
2 . . . . .	900	2	1,400
3 . . . . .	900	3	1,400
4 . . . . .	1,300	4	1,800
	4,000		6,000
			4,000
			2,000

With a margin of safety of 2,000 amperes and an overload of 2,500 the result is obvious.

With dynamos running at full load the brushes will be set forward at a non-sparking position. When the machine breakers open, the load is suddenly thrown off and the brushes will spark excessively, burning the commutator and destroying the straight, even edges of the brushes. Some types of dynamos spark more than others, and it is sometimes possible to avoid extremely bad arcing by running the machine with as short a lead as is consistent with good running during a lightning storm. No doubt a great many stations are afflicted with some dynamos of the older type which, although good running machines otherwise, will spark excessively, regardless of precautions, when the load is thrown off with a forward lead of brushes.

I have stated in the following table the common causes of short-circuits on the feeders, and how they are indicated at the switchboard.

SHORT-CIRCUITS ON FEEDERS.

CAUSE.	INDICATION BY AM-METER	INDICATION BY CIR-CUIT BREAKER.
1. Trolley wire down near station.	Needle thrown over against the stop	Circuit breakers open as soon as switch is closed.
2. Trolley wire down at a great distance from station.	Dead load—may be from 700 to 1,000 amperes.	Remain closed
3. Bad car.	Needle moves unsteadily in a normal swings.	Opens, and after being closed does not again open till motorman starts car and reaches the notches on which trouble occurs
4. Foreign wire across trolley wire and rails.	Needle thrown over against the stop.	Opens as soon as switch is closed.
5. Swinging wire.	Needle thrown over against stop intermittently.	Opens whenever wire swings against trolley wire.
6. Lightning discharge, grounding trolley wire through car.	Needle thrown over against the stop.	Opens violently but can be immediately closed without further trouble.

When the machine circuit-breakers are opened the first duty of the operator is to set back the brushes of the dynamo from the forward or full load point to the neutral or non-sparking position. This is comparatively slow work with the hand wheel and screw, or other more complicated devices which are sent out with the generators by the builders. The device shown in the accompanying illustration is very quick, simple and easy to operate, being merely a new application of the eccentric. It is a great minute saver in just such an emergency as I have stated. I have seen the brushes of five dynamos reset to the non-sparking





It is the relation between the resistances of the series and shunt circuits that regulates the lamp.

If the rod should hang up, or the lamp were permitted to burn until all of the available carbon were consumed and the arc broken, the increased magnetizing effect of the abnormal current flowing in the inner or shunt winding of the cut-out magnet would raise the armature H on the end of which is placed a silver contact I, that when raised against F provides a path for the current, thereby prevent-

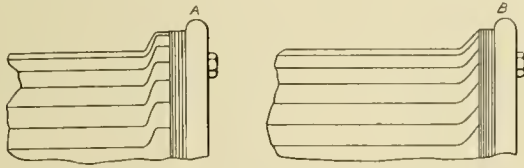


FIG. 3.

ing the shunt cut-out and shunt regulating coils from burning out, which they would surely do if a contact were not made between F and I, the current then going from the positive binding post A, through the outside coil of the cut-out magnet, through the resistance coils to the negative binding post C. The current flowing through the heavy winding of the cut-out magnet then keeps the contacts F and I together.

In operation this lamp should be given 9 amperes. The feed rod must be cleaned frequently with powdered pumice stone and naphtha, which, when applied with a cloth, quickly removes all dirt and tarnish and leaves the rod smooth without producing any perceptible wear on the teeth, which should afterward be cleaned out. If the lamps are carefully inspected, cleaned and oiled every two or three months, as the conditions may require, and the current kept at 9 amperes, no trouble will be experienced with burned out coils.

There is one thing to which I would like to call attention that I omitted in my article on commutators in the January REVIEW.

When turning off commutators, be sure to leave a wide wearing edge on the outer edge of the segments. In Fig. 3, at A is seen a solid wearing surface of copper and mica, which can be kept coated with a good insulating compound, thus preventing the accumulation of dirt near the binding. At B is shown the segments turned to a thin peak, which cannot be well protected. The mica is liable to crumble away; dust and dirt will get in and burn off the binding twine, which holds the strips of mica insulation in place; and if an arc should form and ground in the iron frame, it might be necessary to renew some of the commutator bars and insulation.

## CARRYING PARCELS IN MASSACHUSETTS.

There is now a petition before the legislature in Massachusetts which prays that trolley lines may be granted the privilege of carrying parcels. The railways presented the petition at the request of patrons of the electric lines and disclaim any interest in the matter other than a wish to serve the public in it; the arguments before the committee have been made by parties not connected with the railways.

## THE JULIAN LAW IN KANSAS CITY.

In 1895 the legislature of Missouri passed a law (the Julian law) providing that whenever the consent of public authorities of cities or counties was necessary for the construction, maintenance, etc., of an electric plant, gas plant, street railway, telephone or telegraph plant, that the right should not be granted until advertised for sale at public auction and should then be granted to the responsible bidder who would pay the largest percentage of the gross receipts to the city or county, and by the law 2 per cent was fixed as the minimum amount which must be paid for the first five years, and it was provided that thereafter for each period of five years such percentage should be increased to correspond with the increase in the value of the land occupied and used.

The East Side Electric Railway Company procured a franchise from the city council without observing any of the provisions of this law. Previous to this another street railway franchise had been granted in the same manner and the road has been built and is now in operation. It has been held by the city counselor of the city that the law does not apply to Kansas City, which is organized under a constitutional provision, Secs. 16 and 17, Art. 9, of the constitution, which provides that the people of the city may make their own charter and that it can be amended by a vote of the people and not otherwise. The present city charter was adopted in 1889, and Art. 12 of the charter makes special provision with reference to the granting of franchises, especially with regard to street railways. After franchise was granted to the company, suit was brought by a tax payer enjoining it from proceeding to build the road. The case has been argued and is now held under advisement by the court.

The charter provisions of Kansas City are in some respects inconsistent with the provisions of the legislative act and under the doctrine laid down in *Kansas City ex rel. vs. Scarritt*, 127 Mo., 642, it is contended that the legislative act has no operation within the city. The city counselor of St. Louis has held that the law does not apply to that city. Since the argument of this case in the circuit court the Attorney General of the State has brought quo warranto proceedings in the supreme court against the West Side Street Railway Company, whose franchise was procured in the same manner as that of the East Side Company. The second case will probably be argued in a few weeks, and it is hoped that some time during the spring the final decision of the supreme court of the state with reference to the validity of the law will be handed down.

The decision will no doubt turn upon the application of the Julian law to cities organized under provisions of the constitution providing for local self government to the greatest possible extent and the question of public policy have no effect in controlling the decision.

The theory on which such legislation as the Julian law is based is that the street railway uses the street and makes money out of its business, and should, therefore, pay the city for the use of the streets. And it might be added the city, being thought unable or unwilling to properly protect its interests, the state steps in to make the exaction of such compensation compulsory. This theory is open to severe criticism and reference may be had to the argument of Mr.

Burdett before the Massachusetts committee, which was published in part in the REVIEW for January, for an exposition of the status of street railways in public highways. The highways are for the use of the public and street railways are for the purpose of facilitating the greatest use to which the streets are put, that of travel.

The use of the streets for travel is promoted to a greater extent by the street railway than by any other agency, and to tax conveyances because of that use logically involves the taxation of all the other conveyances using the streets. Whatever sum is collected of the street railway, be it a tax, so-called; or a license fee collected under the police power or an express statute; or a bonus exacted for the franchise, that sum goes to increase the cost to the passenger.

It is thus put by the Massachusetts Railroad Commissioner: "These charges are a part of the cost of transportation which the passenger must expect to pay. Beyond this, it is not easy to see why one who carries passengers for hire in a car should be subjected to a tax for the use of the street, any more than one who carries passengers for hire in an omnibus, or who carries merchandise for hire on a dray. The radical objection to the proposed impost is not, however, that it is a burden on the railway company, but that it is a tax on the traveller. A tax on the carrier is a tax on the passenger. Whatever fare the railway passenger might otherwise have to pay, he must pay in addition to that fare his proportion of the tax; and the possibility of the reduction of his fare is to that extent postponed. Nothing has hitherto been more free than the use of the highway, for all persons, and for all purposes of travel or transportation. There is no good reason why the person who travels in a street car should pay, directly or indirectly, for the privilege of travelling on the highway, any more than the person who travels in a public coach or in his private carriage."

Were a city to erect a toll gate at each street corner and take tribute of those who used the streets, everyone would appreciate the situation quite readily, and perhaps look with less favor on the proposition to derive revenue from the use of the streets.

It might be suggested, too, that since in Missouri the fee of the streets is in the abutting owner, he and not the city should have the tax, if one is to be levied on the use of the street.

### THE TROLLEY WORKS IN THE CAUSE OF TEMPERANCE.

All who have witnessed the growth of street railways in large cities have remarked the effect of a trolley line in improving the moral tone of the street in which it is operated. There are several notable instances of this influence in Chicago, though it may be said that the purifying work is not fully completed.

The New York "Evening Sun" speaks thus of the Brooklyn Bridge line:

"The trolley's contributions toward the material progress of society are obvious, even historical, but that it numbers itself among the ethical forces working for the social welfare was left for demonstration till the Brooklyn trolleys ran over the Bridge. Since the travel on them has become large and continuous, certain facts have come to light which show that the trolley has other effects than the mere

check on population. Sociology will have to consider hereafter its influence in the direction of promoting temperance. The trolley is indubitably to be classed with the agencies for furthering sobriety, lending, as it does, its little mite to discourage the practices of tipping and treating, and bringing home the wandering boy and the cherished parent, duly mindful of the clock which in the steeple strikes one or other odd hours.

"In a word, through transit from the outer edges of Brooklyn to the confines of this city, or from New York to Brooklyn, has hit the proprietors of the gilded liquor saloons bordering on the Bridge Plaza very hard. It involves the cost of a glass of beer to interrupt a ride, to say nothing of the price of the drink for which the ride is interrupted. So many of those patrons of the trolley who were patrons of the saloons forego old habit, go thirsty or slake their thirst in this city or further up in Brooklyn.

"The connections which had to be made in former days gave a convenient opportunity to start the day right by resting meditatively against a polished brass rail and looking thoughtfully in a long mirror, and by the same process it was possible to give a finishing touch to the day's activities. The trolley has changed all that, by taking advantage of a reasonable human disinclination to pay two fares when one will do, and of the law of inertia in accordance with which a man prefers sitting to standing, and once seated will not move from his seat until he has to. All this is very good for the morals of the man, but how about the saloon keeper?"

### A LAUNDRY IN A REPAIR SHOP.

In the summer time the Chicago City Railway Company has over 800 open cars in service and on each car there were 14 storm curtains. The task of cleaning these curtains was very laborious and tedious, each one being spread out separately on a bench and scrubbed with brush and soap. This work required four hands during all the winter, and even

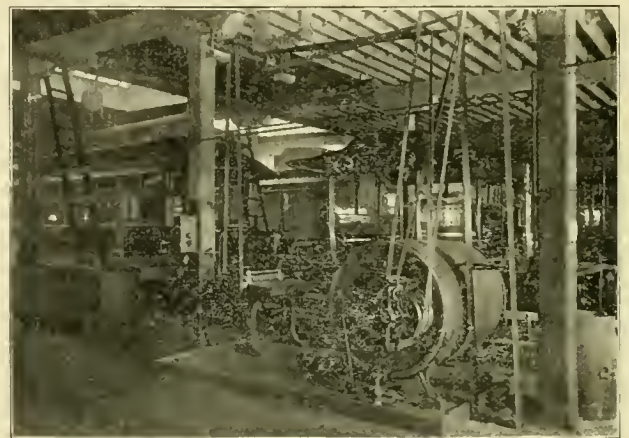


FIG. 1.—WASHING MACHINE.

with all this labor the result was not satisfactory. C. E. Moore, master mechanic, decided to test a washing machine for this work, and as he could find nothing suitable on the market, decided to build one. A machine was designed and



made in the repair shop and set up on the second floor, and in it are some features which are worthy of special mention. The driving mechanism may be seen in the foreground of Fig. 1. The three pulleys, the middle one being attached to the shaft fastened to the barrel, are connected by two belts to a jack shaft. By means of a cam the direction of rotation is automatically reversed, an equal number of rotations being given in each direction so that the curtains will not be rolled into a wad.

The time required for cleaning the curtains has been ascertained and is made uniform by the electric time signaling device. It consists of a clock with a metallic rim around its face having twelve holes in it; four dry cells are connected to the clock hands and the metallic rim. When the machine



FIG. 2.—MANGLE.

is started a plug is inserted in the proper hole and when the contact on the minute hand touches the plug the electric bell rings and warns the operator. About 40 curtains are washed at a time, about 30 minutes being required for the cleansing and 10 minutes for the rinsing.

A belt-driven wringer is placed near the washing machine and the water is drained off through a pipe from the zinc floor. All the apparatus was constructed in the shop at little expense and effects a great saving besides doing the work more satisfactorily.

The machine is also used for washing the towels which are used in the offices and barns. After the towels are passed through the wringer and hung up for a short time they are run through a mangle, shown in Fig. 2. Inside the polished metal cylinder is a gas burner for heating the cylinder to the proper temperature. The roll beneath the metal cylinder is covered with cloth and is adjustable, being regulated by the foot treadle shown. The work is done rapidly by one woman and reduces the laundry bills by half.

## A RECORD IN ACCIDENT ADJUSTMENT.

The claim department has two duties to fulfill: to fight frauds and to settle the claims for which the company is properly liable. A law suit is usually expensive, and while it may be cheaper to compromise any one fraudulent claim than to fight it, every company owes it to itself and to the other companies in the same business to follow the latter course; that is one of the necessary evils. It is in the second class of cases, where there are valid claims, that an adjustor by prompt, just and courteous action, will save his company money. It is quite true that the increasing number of vultures which disgrace the legal profession makes the compromise of claims more difficult, and therefore when the energy and ability of the claim agent enables him to do so he deserves the greater credit. The case at Atlanta, Ga., noted in our last issue, is a brilliant example of what may be done, and the following letter which fixes the "record," so far as we know, explains itself:

EDITOR STREET RAILWAY REVIEW:

In your March issue, under the caption of "A Phenomenal Adjustment," you refer to an accident occurring October 30, 1897, on the Atlanta (Ga.) Railway, and the remarkably quick settlement made for the injuries received therefrom.

On August 16, 1896, a rear end collision occurred between two open cars of the Baltimore City Passenger Railway Company at 12:40 a. m. The cars were returning from a trolley party, and each contained about 100 passengers, and, like the Atlanta accident, the collision occurred at the foot of a steep grade, in a very dark spot. The company's physician was telephoned for, and there being no cars running to the scene of the accident (which was about five miles from the city on a suburban branch), he went out on a special car, and upon his arrival found the injured lying around in all directions—one with a broken arm, another with a broken leg, and numerous contused limbs, cuts, etc.—in all, 23 injured. After giving them the necessary attention, he had them sent home in the police ambulances.

The next morning he started out to adjust the claims of those injured, and, though he either met or heard of several lawyers having already been after the cases, within 48 hours every claim had been settled, and for a total sum of less than \$700, and the company escaped without a single law suit.

NORMAN F. HILL, M. D.

Physician to, and Chargé Claims Department of Baltimore City Passenger Railway.

## LIVERPOOL OVERHEAD RAILWAY.

The report of the elevated railway in Liverpool makes a good financial showing for the past year. There were 735,172 train-miles run and 8,736,750 passengers carried. The average revenue per passenger was 4.045 cents and the expenditures were a little more than 60 per cent of the receipts. The expense in cents per train-mile was as follows: Maintenance of way, 1.174; repairs of structure and stations, 3.140; coal, 1.228; wages at power station, 3.84; oil and supplies, .662; repairs at station, 1.686; traffic expenses, including salaries and wages, 10.24; repairs of cars, .758; general charges, 4.18; miscellaneous, 2.694, making a total of 29.602 cents per train-mile.







etc.," is amplified by distinguishing between "shop" and "not shop" tools. Items 11, 14 and 15 are divided to show the distribution of wages, oil and supplies, and miscellaneous costs between the cable, electric and water power houses. Item 12 is divided to show the fuel cost for electric and cable plants. In the car service accounts, "fuel for cars" is separated from other "car and motor supplies" in Item 22, and "fuel for stations" from "miscellaneous transportation expense" in Item 23.

The gross earnings from operation, the income from other sources, the deductions from gross income, and the deductions from net income follow the form recommended by the committee, with the items not needed by the Twin City Company suppressed.

After the statement of receipts are blanks for the mileage made, passengers carried, etc., which facilitate the reduction of expenses and receipts to a per car-mile run or per passenger carried basis as may be desired.

Form 447, as printed measures 18 in. x 23 in., and is shown here reduced. The arrangement of columns for total amounts, amounts per mile, comparisons with the previous year, and the distribution between the different divisions of the road will be seen on inspection of the diagram.

Form 488 is 18 in. by 20½ in. and is for a comparative statement of the pay roll for the half-month. The officers and employes are classified according to their occupations so that the charge for wages in each department is shown here and the several totals can be drawn off in order to properly apportion the pay roll among the different items shown in Form 447. The object of the vertical columns is apparent on inspection.

On Form 449, printed on a blank 6¼ in. x 10¾ in., is shown a condensed statement for the month drawn from Form 447 and also a condensed comparative statement, with earnings, expenses, and surplus, reduced to the car-mile unit.

The two forms which we have designated, Forms A and B, are printed on opposite sides of a sheet 7 in. x 16 in., Form A occupying one-half of one side and Form B the whole of one side. Form A is a comparative statement of earnings and expenses (both fixed and operating), and Form B the general balance sheet.

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### STREET RAILWAY TAXATION IN TORONTO.

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In 1895 the city of Toronto assessed the rails, poles and wires of the Toronto Street Railway Company for taxation at \$6,500 per mile of single track. The company appealed to the Court of Revision, where Judges McGibbon and Dartnell held, Judge McDougall dissenting, that the assessment should be struck out. In 1897 the city again assessed the company's property in wards 1 and 2; the Court of Revision, on appeal by the company, again struck out the assessment, Judge McDougall dissenting as before. Then, as the company says, the Court of Revision and the city officials apparently entered into an arrangement to defeat the judgment—the Court of Revision striking out the assessment in the other wards. The city then having the right to appeal, appealed to one judge—Judge McDougall—who decided that the rails and poles and wires were liable for assessment, and declined, the company says, to state

a case for the Court of Appeal. Then the company was in the position of being liable for assessment in four wards, and not liable for assessment on like property in two wards, without the right of appeal from the decision of Judge McDougall, while the city had the right of appeal, under the statute, from the decision of three judges. A desire for a uniformity of decision led to the submission of the question to the Court of Appeal, by Order-in-Council.

The Court of Appeals on March 15 decided the question in favor of the city, the majority holding that the court was bound to follow the decision of the Supreme Court in the case of the Consumers' Gas Company, which decision made the gas mains assessable property, and in which decision it was pointed out that there is no difference between gas mains and street rails.

Chief Justice Burton, however, took a different view. The learned chief justice held that the Supreme Court had not, in that case, overruled the case of Fleming against the Toronto Street Railway Company, decided 23 years ago, and that that case, which decided that the rails, poles and wires were not assessable, was still good law. There had not been, the chief justice held, any change in the law relating to assessments since 1869.

The company will no doubt appeal to the Privy Council.

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### BUILDING CARS FOR EXPORT.

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Street railway managers abroad generally express a desire for American cars, but some appear to think that purchases here are out of the question because of the freight charges. To ship a finished car complete would be a very expensive affair and hence the "knock down" cars. The term "knock down" as applied to cars means that the car, after being erected, is taken apart, compactly boxed, and shipped in this condition. The ordinary knock down car has some grave disadvantages which will be mentioned in connection with an improved system of car construction by which not only may the former difficulties be avoided but many valuable features also obtained at the same time.

Some years ago the J. G. Brill Company, of Philadelphia, began the development of a system of car construction by which after erection they could be taken apart and snugly packed for shipment. Many difficulties were encountered, and many modifications of the methods of construction were necessary together with the introduction of a host of new ideas into the shops before the desired result was attained. This plan of packing is called "in the white." By this system the car is completed and the wood and iron work properly primed; the glass, however, is not put in nor is the upholstery furnished. The inside wood work is then treated with a coat of shellac or oil, as may be preferred, and when this stage has been reached and the car entirely finished, with the exceptions mentioned, it is taken apart. The sections, like so many cards, are closely packed in heavy iron bound and reinforced boxes.

This packing, while it calls for great skill and experience, is done with comparative ease. The parts of the car can be forced into actual contact, as there is no danger of injuring the paint, varnish, glass or upholstery. One of the great difficulties of packing cars in the old knock-down fashion arose from the fact that the varnish and often highly decorated panels had to be kept from chafing and protected



from even a touch of any other part. Glass was easily broken, while iron work was prone to come in contact with the linings, etc. There was of course great expense in doing this kind of packing and the boxes were of necessity bulky.

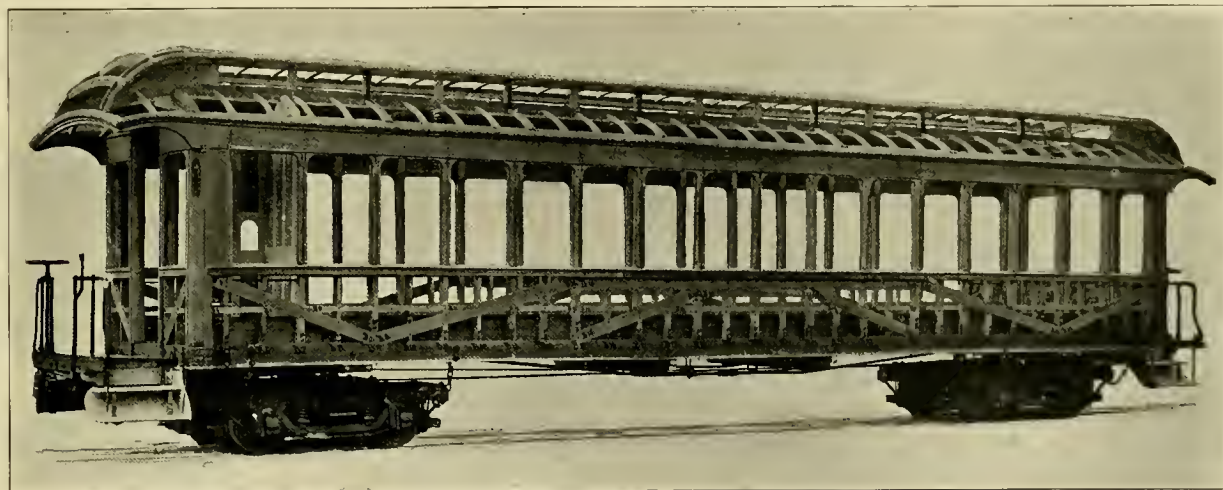
By the new system there is little to be injured; plain surfaces of wood covered with a primer are not easily damaged, and the packing can be made very close and at the same time secure. A car shipped in the white occupies at least 70 per cent less space than it would when shipped whole, and there is a gain of certainly 15 per cent in space alone over the older method. There is also a great reduction in the dangers during transit.

The cars built upon this system have a great advantage in point of durability over ordinary knock-down cars. The latter have their sections sawn apart, and there are many members which are doubled in thickness for this purpose. The double posts, etc., are bulky and awkward and when

to superintend the work. The cost of finishing is also reduced by the fact that the painting, varnishing, upholstering, etc., may be done by local labor.

The illustration shows the method of numbering and lettering used by the Brill Company. The cars in this order were for a South American line situated in the mountain districts, and so far away from tide water and so difficult of access that it was desirable to have the total weight of each package kept down to 160 lbs., a convenient weight where shipments have to be made, as in this case, on the backs of pack animals.

One of the cars was put up in the style shown and the accuracy of the mill work all tested. Numbers were then established for each part according to the system shown, parts coming together taking the same letter and number. The work having been tested by the construction and marking of a single car, all similar parts were marked in the same way and the pieces made up in bundles of the re-



BRILL CAR FOR SHIPPING "IN THE WHITE."

quired weight. The sills, plates and some other important numbers were shipped entire in spite of the excess of weight. Special means were adopted in transportation to meet these weights.

united in the finished car by small bolts, as is the practice, are very weak. Cutting of the sills also reduces the strength of the car body at points where the timbers cannot be effectively reinforced, and in fact the whole construction is a makeshift. The old style knock-down car cannot be said to be durable. By the adoption of new methods of construction, and designing the posts with special reference to taking down for shipment, it has been found possible to make the finished work a unit. The sawing apart is no longer necessary and the car becomes as strong after it is erected as it was at first. In service these cars stand as well and last as long as cars built in the ordinary way and put in service without being taken apart, in this respect showing themselves greatly superior to the old knock-down cars. This is a result which might have been expected, since there are no members severed after construction and the strength of the car is not made to depend on bolts and nuts. The appearance of the car is in no way changed and even an expert would be unable to tell, by the external appearance alone, one of these from an ordinary car.

Besides the saving in freight there is frequently a saving in customs dues by shipping an unfinished instead of a finished car. The system of marking the parts is so complete that it is unnecessary to send men to erect the cars or even

quired weight. The sills, plates and some other important numbers were shipped entire in spite of the excess of weight. Special means were adopted in transportation to meet these weights.

The erection was so simplified by care in designing and in the preparation of the parts that the cars were put together without difficulty by ordinary carpenters. The cars, when finished, seat 62 passengers and have one saloon. Except in the method of construction they are of the ordinary steam road type. The posts, however, are rather smaller than usual, and the absence of panels from between the windows and the narrowness of the letter board make the upper part of the side very light. This is a very necessary and highly valued feature in all warm climates.

#### COPPER OUTPUT.

Recent advices state that there is every indication that the output of the copper mines of Houghton county, Mich., for 1898 will be in excess of 150,000,000 lbs. All producing mines in the district are reported able to make a profit on 10-cent copper, without reducing wages. There are at the present time but eight mines in the county actively producing copper and these employ about 9,000 men.

# CHARGES FOR RENTED POWER

Within a few months we have received several requests for information as to the charges for street railway power when rented or purchased from other companies, and in order to secure the latest data on the subject we have addressed inquiries to those roads which we knew to be renting power. The answers received will be found given below.

It will be remarked that the basis for computing the price paid is not the same on all roads, and the prices cannot be reduced to a uniform basis because of the lack of exact data as to the number of miles made by each car per day, and the kilowatt-hours per car-mile. The grades, speed, weight of car, etc., will have much to do with determining whether a given rate per car-day is reasonable.

A few general statements may be made, however, and may prove of assistance in comparing the rates given. On city lines the mileage made per car per day will be from 100 to 150 miles; on suburban and interurban lines from 200 to 250 miles. The city cars (7 tons) will take about 1 k. w. h. per car-mile on level track; this figure may be increased because of snow or dirt on the rails. Interurban cars of the same size will take .75 k. w. h. per car-mile.

1. The road has 49 miles of track, very little of which is level, and operates 50 to 55 single truck cars in summer and 47 to 50 in winter. Power is taken from a power and lighting company and paid for at the rate of 1.1 cents per kilowatt-hour; formerly the price was 2.6 cents per car-mile. The power plant is a steam one and pays \$1.55 per ton for coal.

2. The road has 5.71 miles of track, on which are two 5 per cent grades each 150 ft. long; the rest of the track is practically level. Five single truck cars are operated regularly and extras when the service demands. The rental is \$10 per day, no charge being made for extra cars. The cars average 127 miles per day, which makes the rate 1.58 cents per car-mile. The power plant is a steam one and pays \$1.05 per short ton for coal.

3. This road is an interurban 9 miles long, in a thickly settled country, and operates 4 single truck cars regularly, with extras morning and evening. The price for power is \$5 per car-day of 18½ hours, the total running time of all cars being divided by 18.5 to give the car-days. The power station is a steam plant, paying about \$3.75 for coal.

4. This is a city line with 15 miles of track with numerous grades, operating from 10 to 21 single truck cars in summer and about 10 in winter. The charge for power is \$1.90 per car per day. The power station is a steam plant using coal costing \$1.75 per ton.

5. This is a city line 10.5 miles long; the line is fairly free from grades, the heaviest being one of 3 per cent

for 500 ft. In summer 10 single truck cars are run and in winter 8. The charge for power is \$2 per car-day of 18 hours for motor cars and \$1 for trailers. Power is furnished by a lighting company which pays \$1.25 for coal.

6. This is a city line with 42 miles of track with few grades; from 30 to 40 single truck cars are operated. Power is purchased from a water power company at the rate of 1 cent per k. w. h., which is quite low.

7. This is a 7-mile road with some heavy grades; from 3 to 5 cars are operated; the cars are of the double and the single truck types. Power is purchased from a lighting company at \$3 per day of 16 hours for 30-h. p. cars, or \$4.33 per day for 50-h. p. cars. The power station is a steam plant.

8. This is a line 2¼ miles long operating 4 cars—single truck—summer and winter. There are several grades on the line. Power is purchased from a lighting company for the lump sum of \$2,800 per year. The coal burned by the lighting company is run of mine, costing \$1 per ton.

9. This is a 9-mile road, owning 9 motor and 3 trail cars. Power is rented from a company which transmits a 10,000-volt current 15 miles and furnishes a 300-h. p. motor to the street railway. The latter pays for current by meter at .6 cent per k. w. h., and guarantees a minimum consumption of 650,000 k. w. h. per year.

10. This is a 7-mile road with long and steep grades. In winter 4 single truck cars are operated and in summer 5 regularly and up to 10 on special days. Power is rented from a lighting company which has both steam and water plants. The price paid is \$13.50 per day for 4 cars and \$1 per day for each additional car. In one year this rate made the cost of power 2.42 cents per car-mile.

11. This is a 4½-mile road with a few grades; 4 single truck cars are operated in winter and 5 or 6 in summer. Power is purchased from a lighting company which pays about \$4 per ton for coal. The street railway pays 3.5 cents per k. w. h. by meter, with a minimum rate of \$3 per car per day. This rate is considered too high.

12. This is a 7½-mile road reasonably free from grades; on an average 5 single truck cars are operated per day throughout the year. Power is taken from a lighting company which has to pay from \$3.25 to \$3.75 for coal. The railway pays \$4.50 per day and in addition 2.5 cents per k. w. h. used as shown by a meter.

13. This is a 7-mile interurban road with some very heavy grades; 4 single truck cars are run in winter and 8 in summer. Power is taken from a lighting company which



pays \$2.35 per ton for coal. The railway pays \$2.75 per car per day, and pro rata for fractions of a car-day.

14. This is a 36-mile city road with quite a few grades; from 35 to 50 double truck cars are operated. Power is taken from a lighting company, which pays \$2.90 per ton for pea coal. The railway pays for power on a car-mile basis, the rates being 2 and 2.5 cents per car-mile.

15. This is a 6-mile interurban with no grades greater than 2 per cent. From 4 to 6 single truck motor cars are operated. Power is taken from a lighting company which pays 50 cents per ton for coal. The rates paid by the railway are \$2 per day per car for 4 cars; \$1.50 per day per car for each additional car, and 50 cents for each trail car for each day in excess of 12 days per month.

16. This is a 35-mile road, with many grades of from 4 to 11 per cent; from 25 to 30 motor cars and from 6 to 10 trailers are operated; there are both single and double truck cars. Power is taken from a lighting company which pays 90 cents per short ton for coal. The rate is 1.6 cents per car-mile for 16-ft. motor cars, half-price for trailers and a higher rate for larger motor cars.

17. This road is near a large water power plant and pays \$25 per horse-power per year.

18. This is a city road with 18 miles of track; from 10 to 13 single truck cars are operated. Power is taken from a lighting company which pays \$4.85 per ton for coal. The charge is 2.25 cents per k. w. h. by meter.

19. This is a 15-mile road; there is one 5 per cent grade 1,000 ft. long on the line, and two of 2 per cent, 600 ft. and 800 ft. long. In winter 12 single truck cars are run; in summer 5 double truck and from 9 to 11 single truck cars. Power is taken from a lighting company which pays about \$1.90 for coal. The charge to the street railway is 1.25 cents per k. w. h. by meter.

20. This road, which has but few grades, had occasion to rent power during the time its own plant was building, and paid \$4 per car per day for the first 5 cars and \$3.50 per day for additional cars. This price included the heating and lighting.

21. This is an 8-mile road fairly free from grades; 10 single truck cars are operated. The company operates its own power station, burning natural gas, and the cost is about \$1.50 per car per day. For a period of 18 months power was rented at the rate of \$3 per car per day and 25 cents for each extra trip.

To summarize: Of the 21 roads replying to the questions, 1 pays a lump sum of \$700 per car per year; 1 pays \$25 per horse-power-year; 2 pay on a car-mile basis; 7 pay on a kilowatt-hour basis, and 10 pay on a car-day basis. The rates per k. w. h. vary from .6 cent to 3.5 cents. The car-day rates vary from \$1.90 to \$4; in most cases there are two rates, one for the first few cars, and a lower one for additional cars. As a rule, a trailer is counted as equal to one-half of a motor car.

## E. H. KEATING.

When Mr. Wanklyn was called to manage the Montreal Street Railway Company the Toronto Railway Company secured E. H. Keating, who was then city engineer, to fill the vacancy. It was his first venture in street railway affairs, but his long experience as engineer for various cities



E. H. KEATING.

qualified him for his new duties. The subject of this sketch was born in Halifax, N. S., August 7, 1844, and after attending at Dalhousie College of that city, took up the study of architecture. At the age of 20 an appointment to the engineering staff of Nova Scotia was accepted and his railroad experience commenced. He was successively connected with the Pictou Railroad, the Windsor & Annapolis Railroad, the Intercolonial Railroad

and the Canadian Pacific Railroad until 1873. For 18 years he was the city engineer of his native town and then accepted a similar position at Duluth, Minn. In 1892, Mr. Keating became the city engineer of Toronto and performed the duties of that office with entire satisfaction until called to manage the Toronto railway on the first of February last. Mr. Keating is a member of the Institute of Civil Engineers of Great Britain, and a member of the American and Canadian Societies of Civil Engineers, and also a Fellow of the Imperial Institute of London. The REVIEW anticipates a successful career for Mr. Keating in the street railway field.

## MR. CICOTT'S EXTENDED TRAVELS.

Frank X. Cicott, who already has a very large acquaintance among street railway men, and who has for the past year been representing a number of well-known American manufacturers in London, sailed on March 24 for a trip around the world. He expects to travel via Gibraltar, Malta, Naples, Port Said, Suez Canal, Egypt, Ceylon, India, Australia, Tasmania, New Zealand, Sandwich Islands, returning to London by way of San Francisco, Chicago and New York, and will cover over 30,000 miles.

Mr. Cicott is making this tour of the world for the purpose of investigating the prospects of electric traction in each of the countries named, and also the possibility of adapting electricity to the many light railways now operating by steam. He will certainly gather a vast amount of highly valuable information, and his friends wish him a successful and pleasant trip.

Another trolley car robbery in Chicago was frustrated but nearly terminated fatally. Three armed men attacked a conductor and motorman of the West Chicago Street Railroad Company while the car was at the terminus of the line. The robbers met with a determined resistance, and after receiving several thumps with the controller handle they retreated. One of them turned and fired a shot, striking Conductor Guyer and seriously wounding him. He is one of the old and trusted employes of the company.

## ROUTED THE SPARROWS.

The rapidly increasing number of English sparrows in all parts of the country has proved a nuisance of no small dimensions to many managers. By some intuition the sparrow seems to look upon the inviting roof and cross beams of a car house as his special property and makes himself at home, together with a large delegation of sparrow relations, running up into the hundreds.

Among those who were put to some means to effectively stop the trouble was H. R. MacLeod, general manager of the Portland & Cape Elizabeth Railway, Portland, Me. His car house and power plant were infested with hundreds of sparrows, and all the usual schemes of poison did not seem to make the slightest impression. After exhausting all the plans suggested, he bought a shot gun and a box of cartridges filled with fine bird shot. One of the men was detailed as executioner, and blazed away for a couple of

## THE CENTRAL LONDON RAILWAY.

A brief description with a map of the Central London Railway appeared in the REVIEW, July, 1897, when the contracts were let, but some developments in designing the apparatus are worthy of special attention. The most noteworthy is the system of distribution and feeding the current to the line. Although the line is but  $6\frac{1}{2}$  miles in length it was determined that an alternating system of distribution at 5,000 volts was more economical than a three wire direct current system at 600 volts.

The power station is located at one extremity of the line. There are to be 16 water tube boilers of American make to supply steam at 150 lbs. pressure. Vicar mechanical stokers will be used; a 1,500-ton coal storage bin is to be at the top of the boiler room; the coal handling machinery will be supplied by the C. W. Hunt Company. There will be six condensing cross compound 1,300-h. p. Reynolds-Cor-

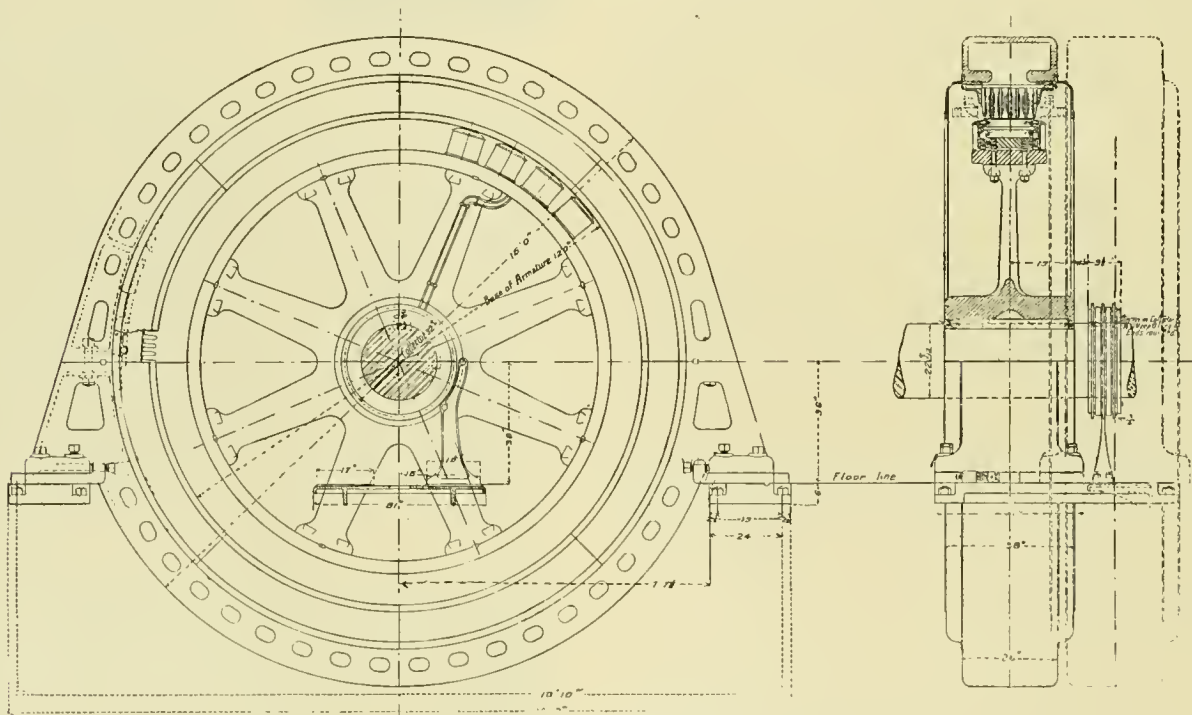


FIG. 1.—850-K.W. ALTERNATOR.

hours, killing a large number. The shot was too small to do any damage to the roof, but got in its work on the birds; and since then, 18 months ago, not a sparrow has been seen in either place, while other neighboring buildings have them in plenty. Mr. MacLeod offers the suggestion as a cure, which is sure and cheap.

## THE NAVY STIMULATES TRAFFIC.

We noted last month that the Atlanta Railway Company had by the judicious use of "yellow" banners managed to keep its cars running to Fort McPherson crowded with people. The Union Traction Company, of Philadelphia, has recently completed an extension to League Island, and the cars are crowded with visitors to the navy yard there. Thousands evince a desire to see anything that savors of war.

liss engines, made by the E. P. Allis Company, direct connected to General Electric 850-k. w. three-phase generators. The exhaust steam will pass into four Barnard cooling towers. Green economizers will be installed. All the steam pipe bends and valves come from the Crane Company, Chicago.

Fig. 1 shows an outline of the generator, which is of the revolving field type, the magnets being mounted direct upon the engine shaft. There are 32 poles attached to the spider, which is built up of laminations insulated from one another. The output of the machine is 170 amperes at 5,000 volts with a frequency of 25 cycles per second. The weight of each generator will be 80,000 lbs., and the efficiency will be 95 per cent. Six of these machines will be installed and space is provided for two more.

From the switchboard, which is designed for high potential alternating currents, will extend two feeder lines to three sub-stations, the cables being carried on brackets fastened



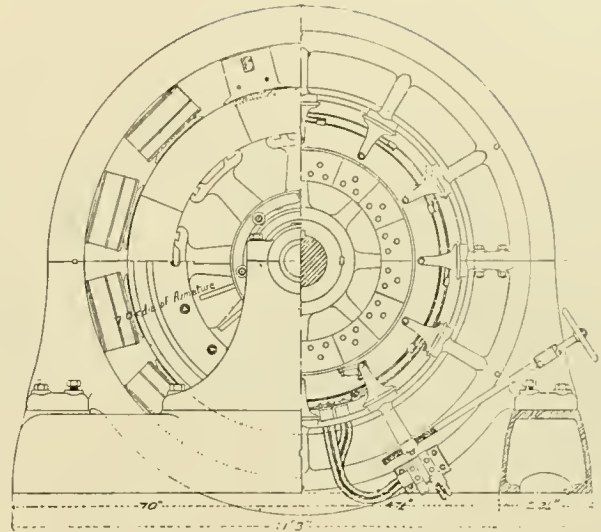
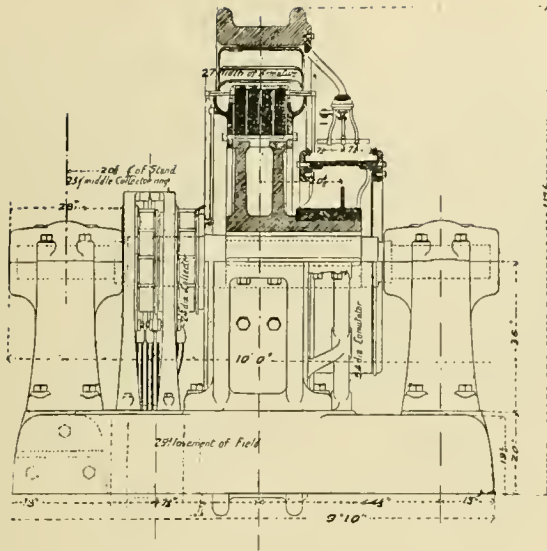


FIG. 2.—900-K.W. ROTARY CONVERTOR.

to the sides of the tunnels. At each sub-station, located at the bottom of elevator shafts, will be static transformers receiving the alternating current at 5,000 volts and reducing it to 330 volts. The alternating current then passes to the rotary converters and is converted to a direct current of 500 volts. The total losses of all kinds in the circuit are estimated to be less than 5 per cent.

Fig. 2 is from an outline drawing of the rotary converter, which has a capacity of 900 k. w. The alternating current will be received by the collector rings shown on the left hand side of the figure and will operate the machine as a motor. From the same windings the current will be rectified by the commutator on the right of the section, and delivered to the third rail. The convertor will have 12 poles,

The Edison-Brown plastic bond will be used on the track rails. Wires will be connected to the lines and rails in such a manner that voltage readings can be taken at any time.

The electric locomotives will be entirely of American construction, resembling somewhat the Baltimore & Ohio type, although of much smaller capacity. Fig. 5 shows the general arrangement of the parts. On each axle of the two trucks there will be a motor having a capacity of not less than 65 h. p., the four motors giving a maximum draw-bar pull at starting of 14,000 lbs. Current is taken from the third rail by two contact shoes and passes through a circuit breaker and ammeter in the cab to the controller. Fig. 6 shows a cross section of the tunnel and locomotive. It indicates that it is necessary to make all the parts very compact to fit in such a confining space. The locomotive is fitted with Westinghouse air brakes. A series-parallel controller, with magnetic blow-out, places the motors four in

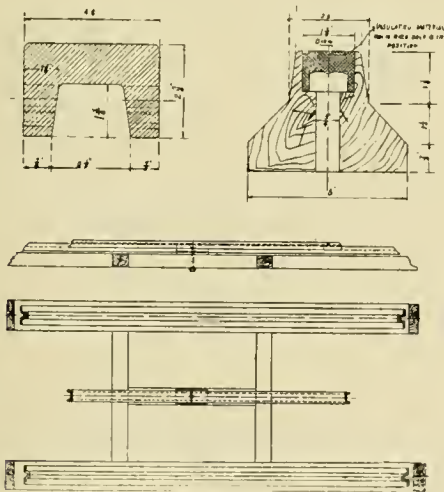


FIG. 3.

will run at 250 r. p. m. and have an efficiency of 95 per cent at full load.

The third rail weighs 80 lbs. to the yard and is rolled to channel section and supported on creosoted wood insulators in the center of the track, Fig. 3. Each joint will be bonded with No. 0006 flexible crown Chicago bonds. The track rails are of bridge section, Fig. 4, weighing 100 lbs. to the yard, and are laid on longitudinal wooden sleepers.

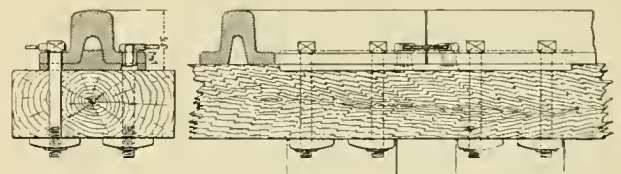


FIG. 4.

series, two in series-parallel and four in parallel, and with the resistances gives 22 combinations.

The motors are gearless, being placed directly on the axles and with no springs between the axles and the trucks. There will be 32 of these locomotives, each capable of hauling seven coaches having a seating capacity of 48 passengers each. Including the locomotive, the train weight will be 150 tons, and an average speed of 14 miles an hour will be maintained with stops of 20 seconds at each of the 13 stations.

A very important factor in maintaining a fast schedule is the alignment of the tunnels, a grade of 3 per cent being on either side of each station. This arrangement at the stations greatly increases the accelerating power and saves braking effort. One who is familiar with the current de-

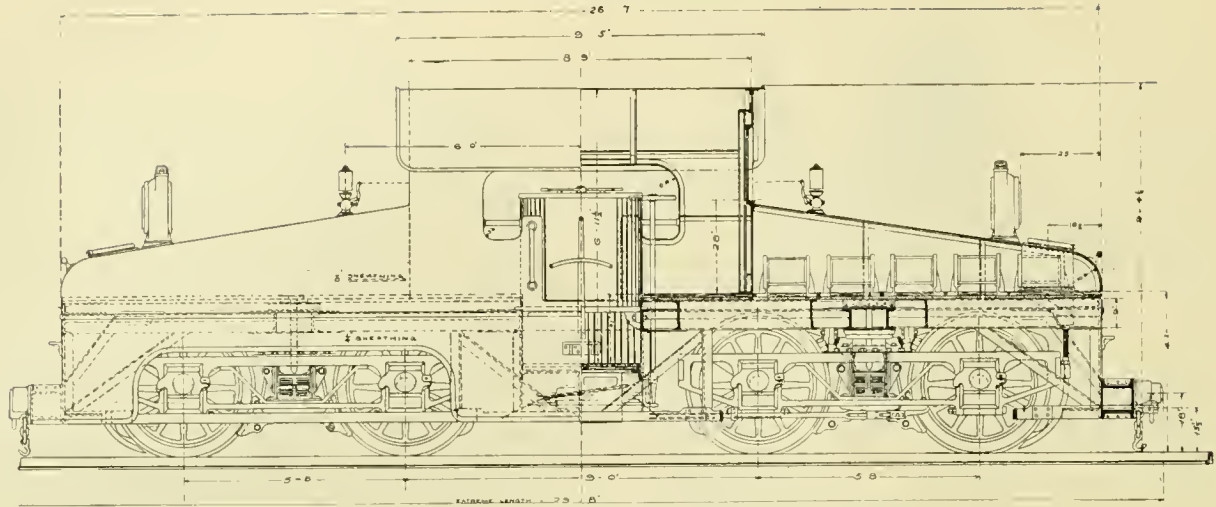


FIG. 5.—LOCOMOTIVE FOR CENTRAL LONDON RAILWAY.

mand of the motors in accelerating the trains on the elevated roads will appreciate that more than a third of the total energy can be saved by the assistance of gravity.

The progress of the work is very satisfactory; the foundations of the power house are laid; of the 22,800 yds. of tunneling only a mile yet remains to be driven, and the

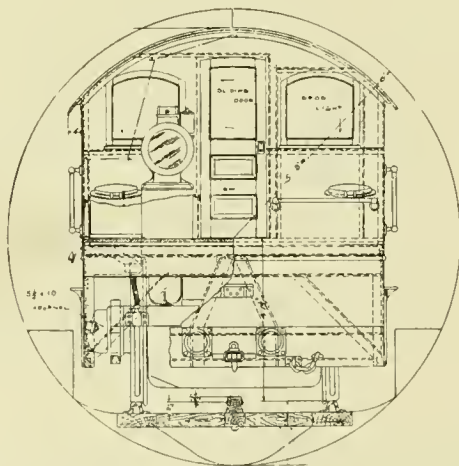


FIG. 6.—CROSS SECTION OF TUNNEL.

American factories are preparing to fill their orders promptly at the time set in the contracts. It is expected that the railway will be opened for traffic within 12 months.

**WANTS A SAFETY BRAKE FOR LONG GRADES.**

The manager of a western road with a very long 6 per cent grade desires suggestions as to the best track brake to use in addition to his wheel brakes. He has already had two or three runaways, fortunately without any serious results, and as the line leads from a pleasure resort from which heavy loads travel all summer he desires to take every possible precaution against accident. His present system of wheel brakes he considers first class, so far as it goes, but is anxious to supplement it with some form of track brake. We shall be pleased to publish any suggestions our readers may be good enough to send us.

**RATES OF FARES IN OLEAN, N. Y.**

The Olean Street Railway Company has recently issued a book of rules governing its employes and giving the rates of fare for passengers and such packages as may be carried on the cars. Each person over 5 years of age, 5 cents. Children under 5 years of age, when accompanied by parents or guardians, and not occupying seats required by passengers who are standing, will be carried free. If over 5 years of age, fares must be collected. Children whose fares have not been paid are not allowed to occupy seats when same are required by paying passengers.

Articles will be carried as follows, when in charge of a passenger, who must pay regular fare for himself:

Bicycles . . . . .	two fares
Trunks . . . . .	five fares
Barrels under 100 lbs. . . . .	two fares
Barrels from 100 to 200 lbs. . . . .	four fares
Small kegs of beer . . . . .	two fares
Large kegs of beer . . . . .	three fares
Peddler's pack . . . . .	two fares
Tin peddler's packs . . . . .	two fares
Wash baskets . . . . .	one fare

All other articles not enumerated will be charged as follows: Twenty to 50 lbs., two fares; 50 to 100 lbs., three fares. Articles occupying unusual space will be charged double rates. Conductors are required to collect above fares for parcels, etc. (excepting small articles, packages or parcels, traveling bags carried in the hands or about the person of passengers), and ring in the same on their registers.

No dogs (excepting small lap dogs) will be allowed inside the car, and they must be kept on the laps of the parties having them. Large dogs must be put on the front platform at owner's risk, and one fare charged for each dog. Under no circumstances will a dog be allowed on the seat of a car.

A rather peculiar incident happened on the tracks of the Broadway cable line in St. Louis. As a rule dogs in the city are very watchful and are seldom caught by the street cars, but in this case a dog laid down on the track and remained until struck by the car, although the gripman and passengers tried to frighten it away. It appeared to be a tramp dog and was tired of the wicked life in a great city.



## POLES.

There are not many electric lines which have been in operation long enough to test the life and comparative merit of poles of different kinds and settings. A sound pole, with ordinary precautions taken for preservation, should last from eight to ten years, but this life may be greatly lengthened or shortened according to the various circumstances. In choosing the kind of poles, some consideration must be given to their mechanical strength, for frequently the poles are subjected to unusual stresses. Last winter, on one of the Chicago lines, a guy rod broke and more than a score of poles snapped off like pipe stems, tearing the lines down and seriously impeding traffic on the street railway and on the railroad, which it crossed at that point. This accident was probably due to the low temperature and to the fact that no provision had been made for any one pole bearing more than its share of the stresses. To avoid a similar occurrence, iron poles were substituted for the poles that broke.

The cost of iron poles is prohibitive except in the larger cities, and the kind of wood to be selected depends on the locality. White northern cedar, northern pine and chestnut are extensively used in the north, and redwood in the west. Cypress, tamarack and red fir are also suitable. Pine is one of the most perfect and symmetrical of all timbers and has a good tensile strength. After seasoning, to impregnate the poles with a good creosote lengthens the life, and is believed to increase the strength. There are numerous preparations for this purpose, some composed chiefly of wood creosote which may be applied with a brush and readily enters the pores of the wood. Frenoline is a composition of 50 per cent wood creosote, 10 per cent pine tar, and 40 per cent oil of tar and has been used by some street railways. Whenever such special preparations are not used the life of the pole will be lengthened by the application of a heavy coat of tar or pitch on the butt end and for some distance above the ground level, also the cornice at the top of the pole should be treated in like manner.

In setting the poles the method and expense depends somewhat on the nature of the soil. In solid soils the hole should only be large enough to get the pole in easily, and the earth and stones should be heavily tamped around it. In sandy or soft ground it is advisable to fill around the pole with concrete, consisting of one part of Portland cement to two or three parts of sand and gravel.

In some cities wooden poles are not permitted, especially in the down-town districts, and many street railways use iron poles in such localities, whether required to do so or not, on account of their superior strength, longer life and more pleasing appearance. Some experiments have been carried on to show that gas pipe poles set in concrete without a protective coating will be dangerously corroded at 10 in. below the surface in three years, but this has not been the case in practice. It has been found that wrought iron yields to the corrosive action of water, with acids which come from the street surface, much more readily than cast iron. The North and West Chicago Street Railroads have a cast-iron sleeve about 2 in. thick, which is slipped over the pole and extends some distance above and beneath the surface of the street. This has proved very effective in preventing the poles from rusting at this point.

It seems to be the rule to neglect keeping the iron poles properly painted, but this is very objectionable as the cor-

rosion sets in and the poles present an unsightly appearance. One difficulty has been in the selection of the right kind of paint. As a result of a series of tests, Max Toltz gave to the Civil Engineering Society of St. Paul, a report of the best paints and the methods of use on iron work.

The paints examined were classified as follows: True asphaltic varnish paints; so-called asphaltic varnishes and paints, of inferior qualities; black carbon paints, in which the vehicle is practically a varnish; iron oxide paints, consisting of more or less iron oxide with siliceous matter and compounds of lime and magnesia; graphite paints, and silica graphite paints. After giving all a trial the best policy was decided to be: 1. At the mills the iron should be cleaned from all loose scales and given a coat of refined linseed oil. 2. When in place the iron should receive one coat of asphaltic varnish paint, made from the best grade of asphalt, linseed oil and gum; or a coat of a paint made of carbon black and boiled varnish. This coat should be carefully applied after the metal has been thoroughly cleaned. Air bubbles should be avoided, and this priming should form a continuous coating, fairly thick. The coat will be dry in about 10 days. 3. As a second coat, a graphite paint is applied as thickly as possible. Care must be taken to select a paint that is at least one-third of pure graphite, the rest of the pigment being natural rock, ground very fine in pure linseed oil. The graphite paint should be bought in paste form, well ground, and contain not less than 70 per cent of pigment and 30 per cent, by weight, of boiled linseed oil; the paste should be mixed with linseed oil at the place where it is applied. This will give a protective coating which will last for many years. The red lead and iron oxide paints have been largely used but are inferior to the graphite paints.

With the different street railways there is a variety of practice, generally differing with conditions. The Manchester (N. H.) Street Railway Company has been using the trolley but two years and this is not long enough to test the durability of either the iron or wooden poles. The standard size for the iron poles is 30 ft. length and 6 in. top. The wooden poles are of Georgia pine and chestnut and the experience so far has been very much in favor of the latter. The chestnut poles have given very little trouble but the pine poles, even at this time are giving out near the surface of the ground. The poles are set from 100 to 125 ft. apart and a rake of 10 in. is given, but at the corners this is somewhat increased. Each iron pole is set in concrete. The pole butts are not treated and the cement is relied upon to prevent corrosion. An emerald green paint is applied with a brush, and two coats have been found sufficient until the present time. A chestnut pole at least 10 in. at the butt, or an iron pole, is considered preferable to any other. The span wires are fastened to the poles by means of eye-bolts, and the feeders are carried on double petticoat insulators attached to spruce brackets with iron braces to the poles.

The Detroit Citizens' Street Railway Company uses white cedar poles, 8 in. at the top, 14 in. at the butt, and 26 to 28 ft. in length, and wrought iron poles, built up of 5, 6 and 7-in. tubes and weighing 600 lbs. The poles are spaced from 100 to 125 ft. apart and have a rake of 6 to 24 in., depending on the width of the street. At the corners 1,300-lb. iron poles are provided. The poles are set in concrete and planted to a depth of 5 to 7 ft., the average life of the wooden pole is between seven and eight years. The span wires are fastened to the wooden poles by a ratchet fastener, and to

the iron poles with cleats and insulators. The feeders are carried on the same poles, with cast iron cross arms and special insulators. Asphaltum is used in painting and requires attention once in three years. Iron poles are preferred, being more economical and having a better appearance in the streets.

The Gloucester, Essex & Beverly Street Railway Company uses only hard pine and chestnut poles with tops from 5½ to 7 in., butts 10 to 15 in., and in lengths of 28 to 35 ft. The poles are planted 4½ to 6 ft. deep, spaced 130 ft. apart, and with a rake of 12 in. The span wire is fastened to the poles by eye-bolts and the feeders are carried on the same poles. Once every two years a coat of paint is applied. Chestnut poles are favored.

On the Springfield (Mass.) Street Railway structural iron and round chestnut poles are the standards. The poles are set 6 ft. into the ground, spaced 100 ft. apart, and a rake of 10 in. is given. The iron poles are made up of 4, 5 and 6-in. pipe; the wooden poles are 7 in. at the top, and both are 30 ft. long. The average life of the chestnut poles is six years, while some of the iron poles which were set in 1891 are still as good as new. Concrete is employed only in quicksand and with corner poles. The feeders are carried on one, two and three-pin brackets and cross arms on the span wire poles. Asphaltum is applied to the iron poles and two coats are given once every three years. The iron poles are considered cheaper than the wooden ones.

The poles in service on the Citizens' Street Railway of Indianapolis are of white cedar, 7 in. top and 30 ft. long, and wrought iron, made of 5, 4 and 3-in., 6, 5 and 4-in., and 7, 6, and 5-in. pipe. The poles are planted in the ground 6 ft. 2 in., spaced 125 ft. apart and with a rake of 22 in. At the corners the heaviest iron poles are in use and are set 7 ft. deep in concrete. The span wires are strung from reels bolted through the poles. Green mineral paint is used and one coat lasts two years. The life of the wooden poles is between nine and ten years; some of the iron poles are six years old, with no signs of deterioration. For heavy traffic lines iron poles are preferable, but on other lines wooden poles give less trouble and lessen the cost of construction.

The Atlanta Railway Company has only red cedar poles

poles. The tops and the butts of the poles are treated with creosote and coal tar, and the poles are painted whenever necessary with creosote and oil paint. Wooden poles are preferred as they last for 10 years, are cheaper, and less insulation is needed.

The Belt Electric Line Company of Lexington, Ky., finds chestnut and red cedar poles, 7 in. at the top and 30 to

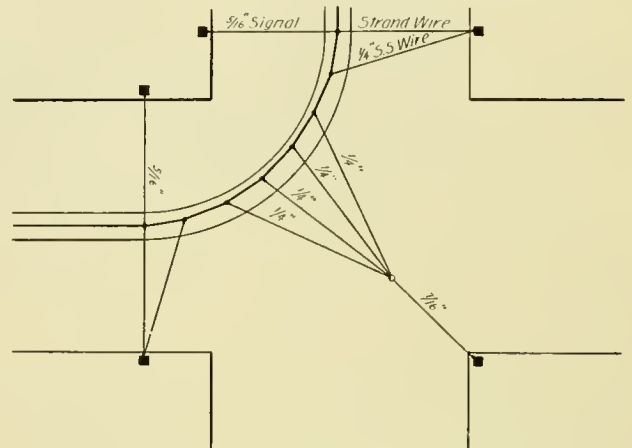


FIG. 2.—SPAN WIRE CONNECTIONS FOR SINGLE TRACK.

45 ft. long, preferable. The butts are treated with tar and last at least eight years. The poles are planted 6 ft. deep; concrete is used in soft earths, but none is needed in clay.

The Anderson (Ind.) Electric Street Railway Company uses only cedar poles with 7-in. tops and in 30-ft. lengths. These are planted 6 ft. deep, 100 ft. apart and with a rake of 24 in. The feeders are carried on four-pin cross arms, oak pins and pine cross arms, on the line poles. Wood's pole ratchet is used for the span wire. The corner poles are guyed to stubs. The poles are painted with white lead and raw oil once in five years. The poles show no signs of decay in five years and are preferable to iron, as they are cheaper, enable repairs to be made on the lines easier, and give better insulation.

The Hagerstown (Md.) Railway Company uses chestnut poles with 7-in. tops and 10-in. butts, 30 to 35 ft. long. These are planted 6 ft. deep, 100 ft. apart, and with a rake of 18 in. The span wires are fastened to insulated eye-bolts, and the feeders are carried on "jumbo" insulators on the same poles. One coat of metallic paint is given each year to the poles, and the poles last about seven years. Wooden poles are preferred, as there is less danger from grounded circuits.

The Ft. Wayne (Ind.) Consolidated Railway Company has both iron and wooden poles in service, the life of the latter being seven years and of the former unknown, for those which have been in service five years are as good as new. The poles are set 125 ft. apart, from 4 ft. to 6 ft. in the ground and with a rake of 6 in. Heavy poles are used at corners and in some cases these are set in concrete. The poles are painted from a ladder once in five years, with an "iron clad" paint. The iron poles are considered better, for they do not break, do not pull in at the top, and thus lower the trolley wires; also, with wooden poles the span wires rust where they pass through the poles.

The Chester (Pa.) Traction Company has yellow and white pine and chestnut poles with 7-in. tops and 9-in. butts. These are planted 6 ft. deep on tangents, and 7 ft. on

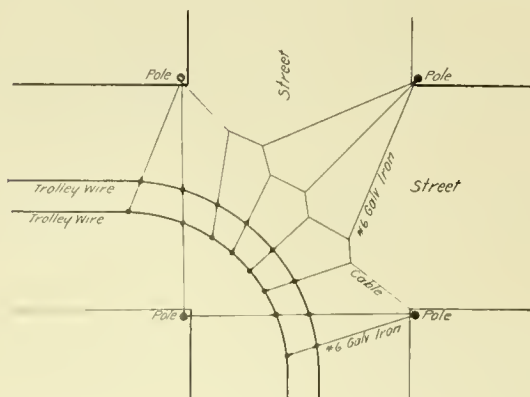


FIG. 1.—SPAN WIRE CONNECTIONS FOR TWO TRACKS.

with 7-in. tops and 30 ft. long. These are set 6 ft. deep, spaced 125 ft., with a rake of 12 in. The span wires are fastened by eye-bolts, and the feeders are carried on top groove glass insulators on cross arms fastened to the same



curves, are spaced 100 to 120 ft. apart, and have a rake of 12 in. The white pine poles last about four and one-half years.

At Birmingham, Ala., cedar poles with 8-in. tops and 12-in. butts and 28 to 35 ft. long are used. They are planted 5 to 7 ft. deep, spaced 120 ft. apart and have no rake. At the corners they are guyed to stubs. Fig. 1 represents the standard span wire connections at a corner.

The Atlantic Coast Electric Railroad Company of Asbury Park, N. J., employs Georgia pine and cedar poles; tops, 7 to 8 in.; butts, 10 to 12 in.; length, 30 ft. A rake of 30 in. is given and the poles are spaced 80 to 120 ft. apart. Concrete is used only at the corner poles. Two coats of paint are given every three years. Plenty of lead is the only requirement in the paint.

It is the policy of the Twin City Rapid Transit Company, of Minneapolis and St. Paul, to use as few wooden poles as possible. The iron poles are in three sizes; center poles, 6 in. in diameter, 25½ ft. long; side poles, 7 in. in diameter, 28 ft. long; for curves, 8 in. in diameter, 28 ft. long. None of the iron poles have had to be replaced, and the estimated life is 20 years; the life of the pine poles averages five years and of the cedar, 10 years. The poles are spaced 120 ft. apart; the center poles are planted 5 ft. deep, and those at the side a foot deeper. A rake of 18 in. is given to the side poles. At the curves concrete is filled in around the butt, but at other places rocks are rammed about the base. At the surface of the ground hot pitch is poured around the pole as a protection against corrosion. The span wires are fastened through an eye-bolt to an insulated cap. The feeders are not, as a rule, carried on the same poles. Paint composed of graphite and linseed oil is used, one coat being applied about every four years. Iron poles are preferred, as they give a more solid construction and are necessary



POLES IN BERLIN.

with No. 6 trolley wire. The heavier construction decreases trouble and repairs.

A year ago when the Portland (Me.) Railroad Company was rebuilding the Deering line, which was constructed in 1891, some of the poles were found badly rotted, but the majority would have lasted five years longer. These poles were of southern pine, with 9x9-in. butts, and were replaced

by poles with 12-in. butts and 8-in. tops and 30 ft. in length. On the Westbrook line about 25 poles were found rotted. From the surface of the ground down about a foot the tim-



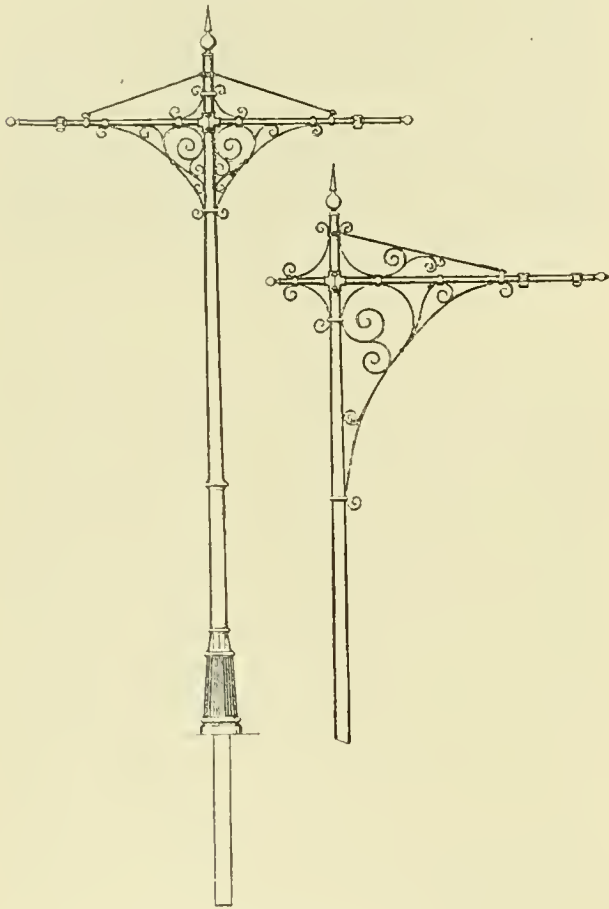
POLES IN DOVER.

ber was rotted a third through, but the ends were perfectly sound. Fernoline is a preparation used in treating the poles. In the later construction the pole holes are dug 4 ft. long and 2 ft. wide. A railroad tie is split in two, and one-half placed in the bottom and the other at the top of the hole. This prevents the poles being pulled over towards the trolley line. At the curves a rake of 26 in. is given and 22 in. elsewhere. The span wires are fastened to ¾-in. eye-bolts through a fiber bushing. Fig. 2 represents the standard span wire connection. The feeders are carried on the same poles by spruce cross arms with 1¼-in. locust pins under the insulators. Every two years the poles are painted, but this is more for the sake of appearance, as the paint would last four or five years. The body of the paint used is white lead mixed with linseed oil and colored to a light green for the tops and a dark green for the lower parts of the poles. Wooden poles are preferred, as they are cheaper, safer for insulation, less leakage on the line, and not so apt to break in cold weather, although it must be said that iron poles look better in the city.

The Albany Railway uses cast and structural iron poles in the city, and wooden poles on the suburban lines. The iron poles are 5 and 6 in. by 27 ft., and those of cast iron are built up of 6, 5 and 4-in. pipe. These poles have been in service for nine years and there have been no renewals. The wooden poles are of Georgia pine, 10 in. at the top, 12 in. at the butt, and 30, 35 and 40 ft. in length. The poles are set 6 ft. deep, and 125 ft. apart, with a rake of 8 in. The span wires are fastened to the poles by insulated eye-bolts, and the feeders are carried on cross arms on the same poles. At the corners heavier poles are used, set deeper in the ground, with additional rake, and guyed where possible. With the wooden poles the tops are tapered, and the butts creosoted. Two coats of graphite paint are applied at first and one added every three years. Iron poles are preferable in the

city, on account of the size and appearance, but wooden poles are recommended on the suburban lines on account of their cost, and by using taller poles the feeders are raised out of the way of low trees and other wires.

The standard poles of the Toledo Traction Company are of iron pipe, built up in three sizes, 6, 5 and 4-in., 7, 6 and 5-in., and 8, 7 and 6-in., and cedar poles with 6-in. tops, 12-in. butts, and 30 ft. long. The poles are set 6 to 7 ft. in the ground and 120 ft. apart. The rake given the iron poles set in cement along paved streets is about 5 in., other places from 5 to 12 in., according to conditions, and the wooden poles are set with from 8 to 18 in. rake. Cement concrete is used for iron poles and with all wooden poles where the stress is enough to warrant it. The iron poles are not protected at the surface of the ground to prevent corrosion. The span wires are fastened to the iron poles by eye-bolts



POLES IN LEEDS.

through insulated tops, and by two turns around the wooden poles. The iron poles are painted with two coats of asphaltum, and the wooden poles are covered with a heavy coat of pitch at the surface of the ground before they are set.

From the foregoing it is noticeable that iron poles are often recommended in the city for their appearance. This question has not received the attention in the United States that it has abroad. Decorative poles are required by the municipalities when granting franchises, and in many cases provision is made for electric or gas lamps on the same poles. The accompanying illustrations represent the types of ornamental poles common in English and continental cities.

## PLANS OF THIRD AVENUE, NEW YORK.

The results of the operation of the underground electric lines in New York and its own experiments with the conduit system on Amsterdam avenue have decided the Third Avenue Railroad Company to change the motive power on its cable and other down town lines.

The change will be started on the 125th street and 10th avenue line, and work will be begun as soon as the weather becomes more settled. The company, after beginning the work, will lose no time and will make every effort to complete the change on all its roads as quickly as possible. The lines to be equipped with the underground trolley system include, besides the one mentioned, the Drydock and East Broadway line, the Grand street line, the 42nd street and St. Nicholas avenue line, and the Union road in the annexed district.

The company is about to build one of the largest and most complete power houses in the country on the Harlem river at Kingsbridge. It is to be an L with a frontage of 100 ft. on 216th street, 450 ft. on 9th avenue and 500 ft. on 218th street. It is to be built of brick and stone, three stories in height. The company has decided to build two power houses for the operation of its various lines. The other one is to be located down town and is to generate the power for the 3rd avenue, the Drydock and the southern division of the 42nd street, St. Nicholas avenue and Manhattanville lines. Plans for this building have not been prepared, nor has its site been selected.

The Kingsbridge power house is to supply the proposed extension in the Kingsbridge Road, the Fort Lee, the Amsterdam avenue and the upper division of the 42nd street line.

The company has just completed a smaller power house at Kingsbridge, which has cost some \$200,000, but this building is to be torn down at once to make room for the new building, which is to have a chimney 350 ft. in height. The present structure was built to furnish power for the extension which the company proposed to build in the Kingsbridge Road from 166th street north; it is two stories high and 115x125 ft. in size. When the company decided to change the motive power of all its lines from horse and cable to electricity it was found that the power house was far too small to meet requirements, and it was determined to remove it and build a larger one.

The company has built a three-story building on the opposite side of 9th avenue, 200x500 ft. in size, in which to store cars. It has room for 500 cars and is equipped with elevators for raising or lowering them from one story to another, as well as complete paint and repair shops.

In a suit brought against the Second Avenue Railroad Company, of New York, a verdict for \$10,000 damages was obtained in the supreme court in favor of an eight-year-old girl who was injured by a horse car last October.

No serious accident has occurred on the Union Loop in Chicago, although the trains often run with a few seconds headway. Recently the locomotive of a South Side train ran into the rear of a Metropolitan train, shaking up the passengers but doing little damage. A mistake in the signals was the probable cause of the accident.



## STREET RAILWAY LAW.

EDITED BY FRANK HUMBOLDT CLARK, ATTORNEY AT LAW, CHICAGO.

*Enjoining the Location of a Street Railway on a Public Street.*

Where the plaintiffs, as abutting proprietors and owners of the fee in a public way sought to enjoin the location of a street railway within the limits of a public way, *held* that the railway is allowed to share with the public, its right of transit over the same and its location does not create any additional servitude.

It matters not what may be the motive power used for surface transit nor whether the transit be the carriage of passengers, of freight, or the transmission of intelligence by telegraph or telephone or of water, gas or sewerage. All these are public uses that the public may permit regardless of the individual, so long as they do not infringe the statute which provides what the public use may be.

The opinion of the court in part is as follows:

The bill also seeks an injunction because the plaintiffs are not only abutters, but owners, of the fee of the way subjected to the servitude incident to public ways, and that the defendant's use is an additional servitude, for which they are entitled to compensation, that must first be paid before the servitude may be enjoyed; and this is the main controversy in the cause, for, if the defendant's use of the way be no additional servitude, then the plaintiffs' right in the way and its use are merged with those of the public, and the public alone, by its laws, must define, control and regulate such use.

What servitude, then, does the public acquire by the taking of land for a public way? It is the right of transit for travelers, on foot and in vehicles of all descriptions. It is the right of transmitting intelligence by letter, message or other contrivance suited for communication, as by telegraph or telephone. It is the right to transmit water, gas and sewerage for the use of the public. It is a public use for the convenience of the public, to be molded and applied as public necessity or convenience may demand, and as the methods of life and communication may from time to time require. Society changes, and new conditions attach themselves. The change evolves new ways of doing things, new methods of communication, new inventions for travel. When the way is constructed, the land owner has his compensation, not only for the land taken, but for the damages sustained, although usually benefits are conferred rather than injury inflicted. These damages are assessed as compensation for a surrender of his land to the public use for travel and transit, not only by the methods then applied, and for the volume then existing, but for all time and for such future use as the exigencies of the time may develop.

When the way has been created, the public controls its use, and regulates its repair by laws that the legislature shall enact. Under these laws, the use must be governed, for the people have a right to say what use will best subserve their interests. They have now said that ways shall be maintained "so as to be safe and convenient for travelers with horses, teams and carriages." That is now the criterion, and a use that infringes upon the rule becomes an unlawful use, and may be prohibited by public prosecution. That rule may be changed, for the public, by law, may regulate the use of its public ways in such manner as the legislature may think will best serve the public interest.

This doctrine allows the public to control the use of

public ways for travel and communication, as it may be pleased, from time to time, to do. The kind of use that may be permitted is of no consequence to the abutter. He must take his chances with the rest of the community in which he lives. Some cases may seem to work hardship, but it is better so than to embarrass the convenience of the people, and cripple and annoy enterprises which the present and future may recognize as necessary for the good and happiness of society.

No matter whether the way be used by the lone traveler on foot or on his wheel, by the two-horse chaise or four-wheeled carriage, by the dray, cart or coach, or by cars that may be permitted to run in the street, whether propelled by beast, steam, electricity, or any other agency that may be discovered suitable for the purpose. No matter whether the vehicle carries passengers or freight, or passes intelligence along its contrivance. All these are public uses, and, so long as they do not infringe the laws that regulate the use of highways, they cannot be prohibited either by the individual or public prosecutor. Ways must be "safe and convenient." When they are not, by reason of any incumbrance or permitted use, then ample remedy may be had by public action, and such incumbrance or use may be removed or prohibited.

The servitude complained of in this cause, therefore, is a public servitude, and lawful, so long as it does not infringe the laws of the state regulating the use of ways. It gains no hold upon the soil itself, but is allowed a share of the public use. Should that use be extinguished, its rights would be extinguished also. It must exist or fall with the servitude of the public; otherwise, the doctrines of this opinion would be illogical. If it gained any vested right in the soil that the public could not extinguish, then, manifestly, it has created an additional servitude, and taken land without compensation to the owner.

These doctrines have been discussed in the numerous courts of this country with varied results. It will not be profitable to review them, for we think best to declare a doctrine best suited to the convenience of our people, and most consonant with the laws under which we live. We have persistently maintained the right of "free fishing and fowling," free and unobstructed navigation of our rivers, the free taking of ice upon them, the right of eminent domain over and in the waters of great ponds; and we now assert the right of the people to control the use of their public ways as shall best meet their necessities, without vexation from the land owner, whenever growth and discovery show the convenience of applying new methods for public transit. Let a public way once constructed be free for the public use and control as it may choose. Let it be free as the ocean is free, as our rivers are free, and as our great ponds and lakes are free, for the use of all the people.

If the reverse of this doctrine be held, the numerous street railways now operating in our state would be crippled, if not destroyed. If every abutter could enjoin their operation unless his damages were paid, there would be no end of litigation and confusion. Moreover, it is now too late to invoke such doctrine. We have already decided that a

MANUFACTURE OF BRONZE CAR ARTICLES.

The use of bronze in connection with street railway car fittings has become quite extensive in recent years, and a short account of the process of manufacture may prove of interest. The copper is melted in a crucible set in a furnace especially designed for the work, and shown in cross section in Fig. 1; it is unnecessary to give the dimensions of the

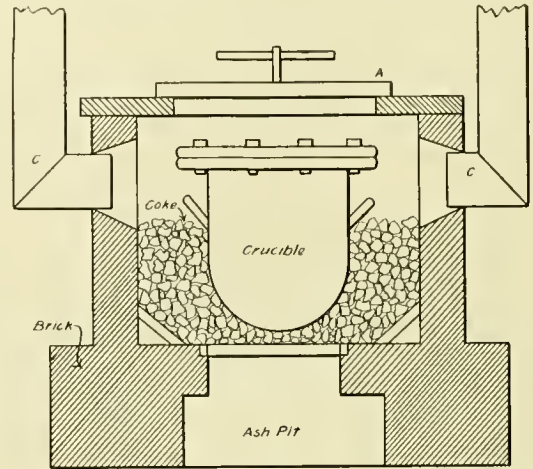


FIG. 1.

furnace, since the latter is in each case proportioned to suit the capacity of the crucible to be used. The arrangement of the cover A, and the stack outlets C, C, is seen in Fig. 1

The piece of apparatus next in importance is that for drying the phosphorus, which is shown in Fig. 2. Usually the phosphorus is dried in an open pan on a wire netting, and if the phosphorus ignites the pan is closed. The arrangement I employ may not be an improvement over the usual way, but it serves me very well. A stone jar of about four gallons capacity is fixed on the top of a sheet iron box; the box is 20 in. high, 12 in. deep and 4 ft. long. Inside is a shelf of sheet iron with numerous 1-in. holes drilled through it and covered with a sheet of asbestos. A water pipe leads into the bottom portion of the box and water is

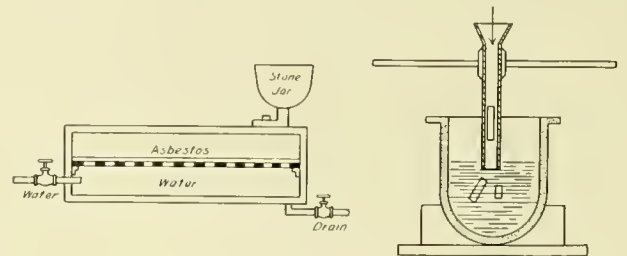


FIG. 2.

FIG. 3.

street railway propelled by electricity creates no additional servitude. *Briggs v. Railroad Co.*, 79 Me., 363; 10 Atl., 47. Relying upon that doctrine, electricity has become the principal motor for all our street railroads; and it would be unjust to now overturn it, if we were inclined so to do. On the contrary, we deem it best, and most consistent with our laws and polity, to affirm it, and, further, that neither motor nor kind of traffic to be engaged in makes any difference, so long as the use does not violate the requirements of the statute, concerning which we are not called upon to decide at the instance of an individual.

(Supreme Court of Maine, *Taylor v. Portsmouth, Kittery & York Street Railway*, 39 Atlantic Rep., 560.)

*Stopping Street Car at Dangerous Place—Implied Invitation.*

A motorman in charge of an electric street car on a dark night ran his car past a point at which the cars regularly stopped and did not go back to take up plaintiff, who desired to board the car, but stopped the car and held it at a point 14 or 15 ft. farther on where it was dangerous for any one to go to the car, of which the motorman was aware, and the plaintiff was injured in attempting to board the car. Held, that there was an implied invitation to the plaintiff to board the car at that point when it was stopped and held there, and that the motorman was negligent in so doing, and that the plaintiff's contributory negligence was a question for the jury.

(*Vasele v. Grant Street Electric Railway Co.*, 9 American & English Railroad Cases, N. S. 75.)

*Power of Municipality to Require Conductors on Cars—Reservation of Right to Regulate Operation of Road.*

A state statute conferred upon the mayor and aldermen of a city power to make all such ordinances, rules and regulations relative to the streets as they should see proper and necessary, and to establish such by-laws not inconsistent with the laws of the land as might tend to preserve the quiet, peace, safety and good order of the inhabitants. A street railway company was incorporated under an act of the legislature, by which act it acquired the rights and franchises of two companies who had preceded it, subject to the duties and liabilities of such companies, the charters of which provided that the city council should have the power to regulate the running of the cars. Such succeeding company, subsequently desiring to operate its cars by electricity, presented a petition to that effect accompanied by a draft of ordinance granting the desired leave, which contained a provision reserving to the city council the right of regulating by ordinance the manner of operating the railway, and of altering and amending the ordinances relating thereto by such enactments as, in their judgment, the public welfare might demand. Held, that the city council had power to pass an ordinance that no street car should be run unless in charge of a conductor.

(*State ex rel. Columbia Electric Street Railway, Light & Power Co. v. Sloan, Mayor et al.*, 9 American & English Railroad Cases, N. S., 44.)

There is some legal difficulty between J. J. Shipherd, president of the Ft. Wayne Consolidated Electric Railway Company, and Frank Robinson over \$150,000 worth of stocks and bonds of the company. Nine indictments have been secured in Cleveland against Mr. Shipherd.

always kept there. For 75 lbs. of copper I use about 3 lbs. of phosphorus; I first put the phosphorus in a solution of vitriol in the stone jar, leaving the sticks for about 40 minutes; they are then placed upon the asbestos covered shelf and soon dry, the coating they have received in the solution protecting them from the air, obviating all danger of ignition and fitting them to go into the crucible of melted copper.

At first I experienced a great deal of difficulty in introducing the phosphorus into the molten copper, but finally suc-



ceeded by using a dip pipe, as shown in Fig. 3. This pipe is of cast iron, 3 in. in diameter inside with a funnel-shaped top. This pipe is held in place with the end below the surface of the metal by two workmen, while a third drops in the phosphorus, which quickly melts and mixes with the metal.

For casting the arrangement shown in Fig. 4 was adopted after some experimenting. The flask, pouring gates, etc., do

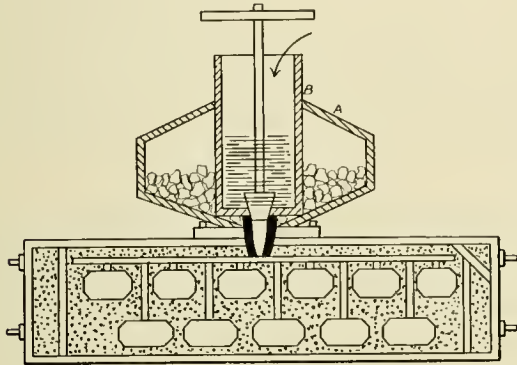


FIG. 4.

not differ from those commonly used and require no description, except to say that fine sand is preferable and that plumbago makes a good facing for the molds. The main gate B, however, should be provided with some means for heating the metal in it; some castings may be made without this apparently extra work of heating, but unless all the conditions are nearly perfect the metal will not flow as freely as it should and defective castings will result. The main gate is provided at the bottom with a stopper for closing the outlet into the mold. The heater A is a chamber of sheet iron with openings into which the main gate is set. The metal is poured into the main gate at the top and a coke fire in the heater keeps it hot.

The finishing of phosphor bronze castings is very similar to the finishing of nickel-plated castings, and it is only necessary to mention the novelties in the apparatus used.

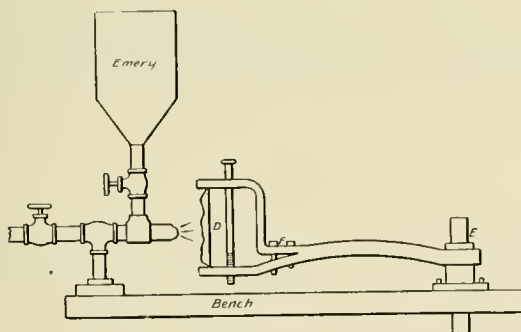


FIG. 5.

One of these is a mechanical scratcher built on the principle of the ordinary foundry tumbler, but covered on the interior with leather set with No. 30 steel wires; the falling of the castings on these flexible steel points for an hour or so gives the surface an odd and attractive appearance. Another arrangement for giving unique effects is the emery blast shown in Fig. 5. The casting is supported in a clamp at the end of a spring bracket set on a pivot so that the workmen bring any portion of the work in front of the blast. About No. 70 emery is used. F.

## AN OLD ADVERTISER'S ADVICE.

In New York a few days ago, says the "Globe Democrat," the resident partner in that city of the Wanamaker firm delivered an address before the Merchants' Association on "Advertising as a Business Force." The speaker based his remarks on a long experience in extensive and successful newspaper advertising. He began by saying that a retail business may be divided into three parts: the goods to be sold, the persons employed to sell them and the advertising. While the three were considered of equal importance the advertising was called "the dynamic power of the business," setting it in motion and increasing its volume. One point brought out is that the relative importance of advertising is not taken seriously enough, that is, not regarded as one of the essentials. The speaker would no more think of running a business without advertising than of owning machinery without a motive power. He prefers newspaper advertising because other kinds are resisted by the public, that passing through the mails often going direct into the waste basket.

Money, it was admitted, can be wasted in advertising. The advertiser may underrate its value and, indeed, give but slight study to its principles, and be soon discouraged. "The most successful advertising I have ever known," said this expert, "is that which has been exploited on a very large scale. The man who has had the courage to advertise to a certain extent and spend \$20,000, should have had the courage to spend another \$5,000 and vitalize all the rest." In these cases there is a lack of the needful faith and persistence. Advertising was presented as a necessity of the retail business, its pulse, movement and circulation. The newspaper column is the merchants' rostrum. In using it to address the public his statements must be veritable. Advertisements must be well expressed, and the illustrations of a good grade. It has been the Wanamaker policy to advertise in a terse, direct style, though freely as to space, and to use a typography which newspaper readers soon recognize as distinctive.

An anecdote was related of Gladstone, which the speaker could vouch for as true. The English statesman was asked why he bought the American edition of a certain American magazine instead of its English reprint. Mr. Gladstone replied that the American advertising interested him, and was to his mind a means of gauging the material prosperity of the country. Mr. Wanamaker's representative concluded his address by asserting that sound theories of advertising, founded on reason and common sense, are as certain to produce good results as are the forces of nature to bring forth a harvest. The growth of business is due to its controlling influences, among which advertising vitalizes the others. It is well known that newspaper advertising has been the corner-stone of the immense Wanamaker retail trade in Philadelphia and New York, and this address embodies experience rather than theorizing.

The Kingston (Jamaica) Street Railway Company has contracted with the Montreal Street Railway Company for 20 electric cars.

Owing to a strike of about 20 building laborers the work on the power station of the South Side Rapid Transit Company, of Chicago, was recently delayed for a short time.

## THE TROLLEY.

A portion of the story of the underrunning trolley is thus told in the April number of Cassier's Magazine: The now familiar trolley wheel and its pole in electric railway practice were not always held at their high value of today. William J. Clark, the head of the railway department of the General Electric Company, of New York, in speaking recently, in a reminiscent mood, told of his struggles about 10 years ago to sell the patent covering the devices in question. Mr. Clark was then acting as agent for Mr. Van Depoele, the inventor of the underrunning trolley, as it is called. He offered it to one group of American capitalists

## LOS ANGELES &amp; PASADENA INTERURBAN.

Pasadena is the largest and most beautiful suburb of Los Angeles, the metropolis of Southern California. These two cities are about 12 miles apart and are connected by the lines of the Pasadena & Los Angeles Electric Railway Company which are in all 44 miles long. The scenery along these lines is very beautiful as may be seen from the group of pictures in Fig. 1. The one in the upper left hand corner is from a picture taken at the Altadena terminus of the road and is the point at which connection is made with the celebrated Mt. Lowe railway. In the upper right hand corner is shown a view on the line running to the suburb of Altadena. The

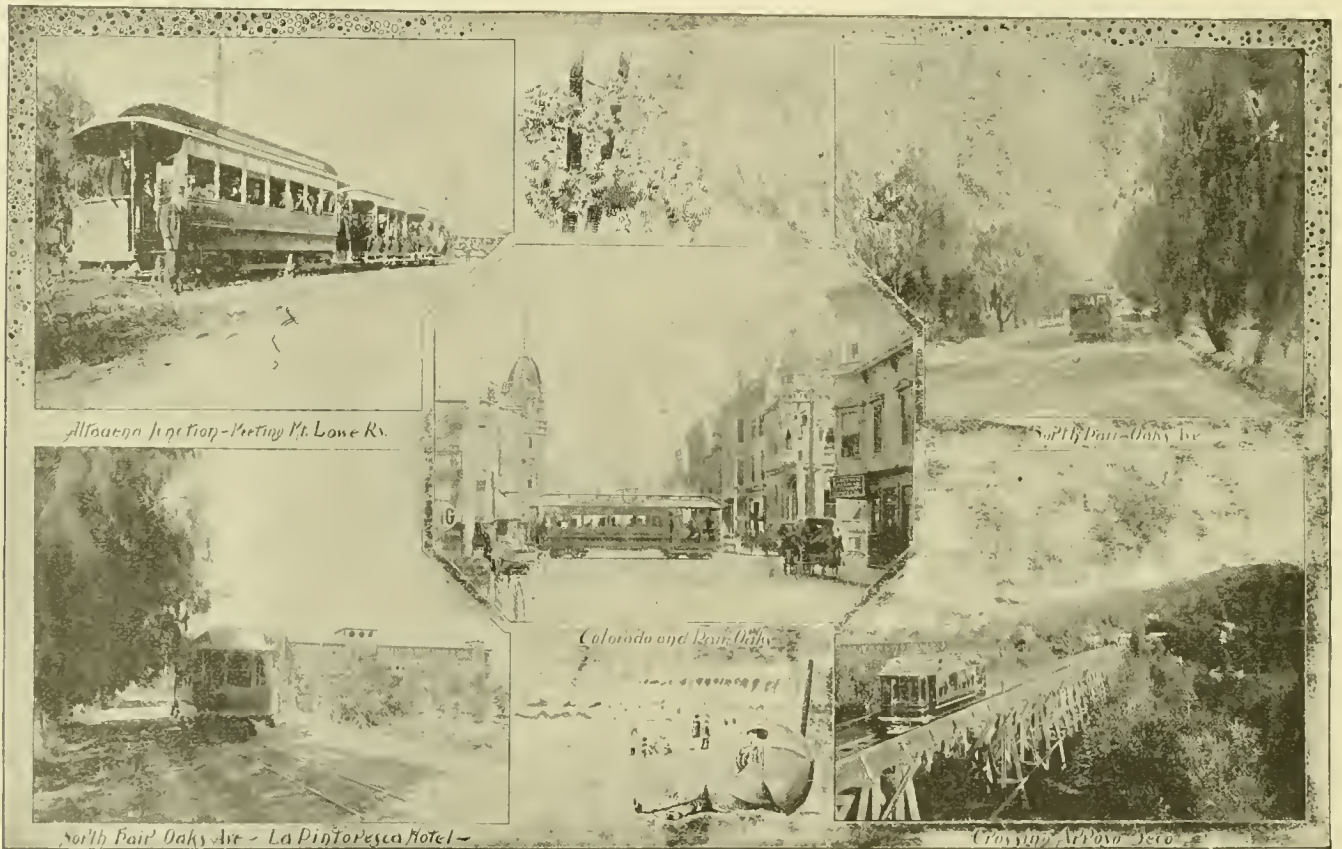


FIG. 1.—SCENES ON THE PASADENA & LOS ANGELES ELECTRIC RAILWAY.

after another, at an upset price of \$100,000, without the slightest success, though he was prepared to dispose outright of the patent for that sum. Finally an offer of \$5 for each car fitted with the underrunning trolley was made to him and accepted. Mr. Clark continued that he was happy to say that from this contract he has since paid over to the Van Depoele heirs the sum of \$200,000. In his opinion, the three inventions which had brought about the immense development of electric urban and interurban railways were the Sprague patent for motor suspension, the Van Depoele underrunning trolley, and the substitution of carbon for copper brushes on the commutator. Mr. Sprague, who installed the first practical trolley line at Richmond, Va., where some grades were as steep as 8 per cent, found that with 30 cars in service it cost \$9 for a day to replace the copper brushes which had vanished into sparks.

picture in the center was taken at the corner of the two principal streets in Pasadena, the offices of the railway company being in one of these buildings. The lower left hand view is on the Altadena division with the Hotel La Pintesca in the background. The scene in the other corner is on the main line passing through the charming valley of the Arroyo Seco, and in it is a car crossing the viaduct which is 45 ft. high and 900 ft. long, between Garavanza and Lincoln Park.

In Fig. 2 is a front view of the car house and repair shop taken from Fair Oaks avenue on which the main line of cars run. Combination open and closed cars, a type in general favor in California, are here used. The pleasant temperature throughout the year makes it possible to use such cars with comfort at all times. The cars are finely upholstered and finished in mahogany with plate glass windows. The cars





FIG. 2.—CAR HOUSE.



FIG. 3.—INTERIOR OF SHOPS.

are 35 ft. over all and were built by the American Car Company and the J. G. Brill Company. Fig. 3 shows the interior of the car and paint shop.

The express car, with the superintendent's office and trainmen's room in the background, is portrayed in Fig. 4. Although the car has been running but three months it is now on a paying basis. The Electric Express & Storage Company has charge of this business, with offices and warehouses in Pasadena and Los Angeles. The express car makes four round trips between Los Angeles and Pasadena each day and not only are the charges very reasonable but from 12 to 24 hours are saved in the shipment of goods by this route.

The rates are as follows: Packages from 1 to 25 lbs. delivered from office to mile limit, 10 cents; charge of 5 cents for every additional half-mile. Packages from 25 to 75 lbs. delivered from office to mile limit 15 cents; charge of 10 cents for every additional half-mile. Packages from 75 to 100 lbs. delivered from office to mile limit, 20 cents; charge of 15 cents for every additional half-mile. Trunks delivered from express office to any part of city inside of one mile limit, 25 cents; delivered within 1½ mile limit, 35 cents; same charges will apply on calling for trunks. Trunks transported and deliv-

ered between Los Angeles and Pasadena within ordinary distances for 50 cents each, and at small additional charge for longer distances; several trunks at reduced rates.

Hand packages .....	10 cents.
Barrel flour, apples, etc. (under 200 lbs.) .....	15 "
Baby cab .....	15 "
Sewing machine, sofa or table .....	15 "
Syrup, oily tar, etc., per bbl. ....	25 "
Bicycles, used—uncrated .....	10 "
Bicycles—crated—each .....	15 "
Cases of boots or shoes .....	15 "
Easy chair .....	15 "
Dining chairs, per half dozen .....	25 "
Mattress or bed spring .....	15 "
Oil stoves .....	10 "
Stoves and small ranges .....	35 "
Mirrors, 40 inch .....	25 "
Bureaus .....	25 "
Refrigerators, set up .....	25 to 50 "
Sacks of potatoes, heavy goods, etc. (in lots of over 1,000 lbs.), per 100 lbs. ....	10 "

Orders may be telephoned between the two cities. Special rates are given to merchants who have considerable traffic business and discount books, containing 50 to 200 ten-cent stamps for payments of express charges, are sold.



FIG. 4.—EXPRESS CAR.



FIG. 5.—FUNERAL CAR.



FIG. 6.—FUNERAL CAR.

Figs 5 and 6 show two views of the funeral car now in service and which has met with much favor. It is one of the main line cars which has been suitably arranged and draped. The rates charged are about one-third of the cost of a hearse and carriages. When the business increases sufficiently it is the intention of the company to construct a car especially for this purpose.

The cost of coal in California is very high for it either has to be brought over the mountains or shipped from some foreign port. Fortunately oil fields of considerable magnitude have been developed in Southern California, particularly in Los Angeles, and furnish the best and cheapest fuel obtainable. Fig. 7 is from a photograph of a motor car attached to a tank car used in hauling fuel oil from Los Angeles to Pasadena. The car is standing alongside the power station and has just finished unloading 1,644 gals. of crude oil into an underground tank from which it is fed to the boilers. On an average of 1,800 gals. are used per day, the price varying from 60 cents to \$1.00 per bbl. of 42 gals. The interior of the boiler room, the fronts of the Stirling boilers and the oil feed pipes are shown in Fig. 8.

It has become necessary to add to the equipment in the power station to maintain a better schedule. A 15-minute service between Los Angeles and Pasadena in the winter



FIG. 7.—OIL TANK.

time during the tourist season does not accommodate the travel but the limited capacity of the power station prohibits a shorter headway. The present equipment consists of two Ball & Wood engines, one 450-h. p. and one 250-h. p., connected to two 200-k. w. Edison and one 112-k. w. Westinghouse generators. This will be greatly increased by the addition of a 650-h. p. Ball & Wood engine, two 250-h. p. Westinghouse generators, and two 40-k. w. boosters. Between the two cities a storage battery plant will be installed and will be complete for next winter's traffic. This will enable the company to give a 5-minute service during the busy hours in the morning and evening.

The officers of the company are C. W. Smith, president and general manager; W. H. Smith, assistant general manager and general passenger agent; H. I. Chatfield, auditor;

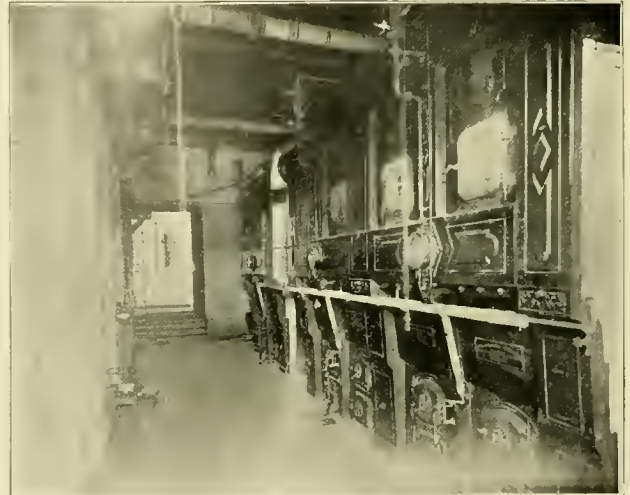


FIG. 8.—BOILER ROOM.

F. H. Jones, superintendent of transportation, and G. J. Kurtz, chief engineer. We are indebted to the kindness of W. H. Smith for the photographs here reproduced.

### EXTENSION OF THE WASHINGTON & GREAT FALLS.

F. H. Fowler, superintendent of the Washington & Great Falls Electric Railway, advises us that the company has commenced work on the building of two miles of double track, extending the line from Cabin John Bridge to Great Falls. The line now extends from West Washington to Cabin John Bridge and is along the banks of the beautiful Potomac for the entire distance; there are many curves and cuts and the route is a very picturesque one. The passenger traffic is large because of the football and bicycle grounds and the Chautauqua assembly grounds located on the line.

Heretofore the cars have been run at intervals of 15 minutes, being spaced by telephone, but the Skeen automatic block signal system is being installed, and this will enable the headway to be reduced to 2½ minutes with perfect safety. The Skeen Electric Switch & Signal Company, of St. Louis, is under contract to have its system in place by April 15, as the road has arranged to carry the visitors to the mothers' convention to be held at the Chautauqua grounds and commencing April 20.



**WOMEN MAY SMOKE.**

If our memory does not play us false, we have read accounts of women being ejected from street cars because they persisted in smoking. Such acts can not fail to be condemned as unwarranted interferences with the unalienable rights of liberty and the pursuit of happiness, in defence of which our forefathers fought and bled and died, and it is therefore with great satisfaction that we learn of the action taken by the Metropolitan Street Railway Company, of New York. The following letter was in answer to a request that separate smoking cars for women be put in service.

"Dear Madam: I have your esteemed favor, requesting that when the summer arrangements are made the Metropolitan Street Railway Company provide separate open smoking cars for ladies. I notice what you say about the great antiquity of smoking as a source of feminine consolation, and am interested in your statement that it is growing in popularity.

"As you speak with the assurance of perfect knowledge, and as I am lamentably ignorant of female habits, it is with hesitancy I suggest that I cannot believe the necessity is pressing enough to justify compliance with your request. Keen as is the general rivalry, the smoking habit is not, I think, quite so general with women as with men, and yet heretofore the Metropolitan Street Railway Company has never furnished separate cars for its smoking male patrons. Three seats in each open car, have, up to this time, sufficed to accommodate this class and gender of its patrons.

"May I suggest—since at the moment there seems to be no justification for separate women's smoking cars—that the gallantry of the gentlemen for whose exclusive use three back seats are reserved, can always be relied upon to provide a place, and even a light, for any woman who wishes to smoke?

"Yours sincerely,

"H. H. Vreeland."

**CONSOLIDATION IN NEW JERSEY.**

The annual meeting of the Consolidated Traction Company, of Jersey City, N. J., was held on March 28, and by a unanimous vote it was decided to lease its property to the North Jersey Street Railway Company, of Newark. The lease provides that the North Jersey Company will assume the obligations of the Consolidated and guarantee dividends on the \$15,000,000 of stock of the latter; nothing is to be paid on this stock the first year, 2 per cent the second, after that the rate is to be slightly increased each year until it reaches 4 per cent at the end of eight years.

The Consolidated Traction Company comprises the following companies: The Jersey City & Bergen Railroad Company, the Jersey City, Harrison & Kearney Railroad Company, the Newark Passenger Railway Company, the New Jersey Traction Company, the Passaic & Newark Electric Railway Company, the Passaic & Newark Electric Traction Company, the Newark Plank Road Company, the Port Richmond & Bergen Point Ferry Company and the Bergen Point & Staten Island Ferry Company.

The North Jersey Street Railway Company already controlled the South Orange, Montclair, Glen Ridge and Caldwell lines.

The Consolidated Traction Company re-elected its old officers: E. F. C. Young, president; E. B. Gaddis, David Young, vice-presidents; E. N. Hill, treasurer; Thomas J. George, secretary. The present officers of the North Jersey Company are: J. K. Cobiere, of Caldwell, president; Henry M. Doremus, of Newark, vice-president, and Wilbur Johnson, Orange, secretary and treasurer. It is stated, how-

ever, that upon the completion of the arrangements for consolidation the officers of the Consolidated will become those of the North Jersey.

An amicable agreement has been reached between the Brunswick and the New York & Philadelphia Traction Companies, which have for some time past been engaged in a fight for franchises in Middlesex and Union counties. Notwithstanding the agreement it is stated that a line along the Raritan river, paralleling the Brunswick line from New Brunswick to Bound Brook, will be built on the south side of the river. The New York & Philadelphia Company will build to within a few miles of New Brunswick and be met by an extension of the Brunswick Traction Company.

**DEATH OF COLONEL DYER.**

Lt.-Col. H. C. S. Dyer, president of the Colorado Springs & Cripple Creek Electric Short Line Railway Company, died very suddenly in London. Colonel Dyer was born in the year 1834. At the age of 18 he entered the Royal Artillery, and during his army career he saw a good deal of active service. He served in the Crimea, had his horse killed under him, and not only took part in the siege but was present at the fall of Sevastopol. During the Indian Mutiny he took part in many important engagements. He

was engaged in the relief of Lucknow and the battle of Cawnpore, in which he again had his horse killed under him. He took part in several other engagements, and retired from the Army with a high reputation as a soldier. He was on several occasions mentioned in official dispatches, and he held a medal with two clasps. He was also a Knight Commander of the Orders of the Crown of Italy, of Charles VII. of Spain, and of the



LT.-COL. DYER.

Rose of Brazil, while he also held the military order of merit of Spain. Colonel Dyer was at the head of the Federation of Northeast Coast Employers when the "engineers' strike" commenced last year and at once threw himself into the conflict, joining with employers of the Clyde, and the London Association and forcing a general battle in place of the piecemeal attacks contemplated by the strikers. He recognized the true issue and its importance, and to his energy the satisfactory outcome of the struggle is largely due, though the mental and physical strain proved too great a tax on his strength.

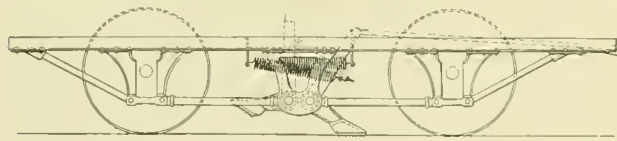
The Interurban Railway Company, of Saginaw, Mich., is strengthening its roadbed across the prairie land by filling in 500 car loads of gravel.

Although the transfer privileges of the Hamilton syndicate of railways in St. Louis are very liberal, General Manager McCulloch is considering the advisability of extending the use of the transfer between the Cass avenue, Northern Central, Union and Franklin avenue divisions and the Southwestern line.

OF INTEREST ABROAD.

In the "Review" for May, 1897, page 310, was a list of the questions proposed for discussion at the Tenth General Assembly of the Permanent International Tramway Union of Europe, to be held in Geneva in August next. We have lately received from M. Nonnenberg, the secretary of the Association, the replies which have been received, and abstracts of a few of them may prove of interest to American railway men and manufacturers.

All the companies making replies recognize that hand brakes are suitable for light cars and low speeds only, and that mechanical traction demands a power brake, and both electric and air brakes are highly recommended—the Sperry electric and the Standard air brakes are mentioned as giving



BRAKE FOR HEAVY GRADES.

most satisfactory service. The illustration shows a brake designed for use on steep grades which has been adopted at Lausanne and at Havre. The shoes or grips engage pieces of timber laid along the inner side of the rails, and are brought into contact by a worm and gear operated by a brake handle of the ordinary type. The shoes are  $4\frac{1}{4} \times 6\frac{1}{2}$  in. and the faces consist of pyramidal teeth about  $\frac{3}{4}$  in. square at the base and  $\frac{1}{2}$  in. high.

Regarding the electrical connection of rails, the Compagnie Générale Française de Tramways, Paris, says: "The welding of the rails by the Falk process, appears to give very good results at Lyons."

The Munich Street Railway answers the questions propounded in a manner short, sharp and decisive and says: "The best system of electric connection between the rails is the 'Chicago railbond' for rails buried in the ground."

Regarding accumulators, the Dresden Street Railway writes that it uses a mixed system, trolley and storage battery, having commenced the operation of the line in April, 1896. The belief is expressed that the weight of the batteries may be reduced by the more careful designing of the various parts, but any reduction in the size of the plate, made with a view to reduce the weight, decreases at the same time the capacity and the life of the battery. The life of the battery is estimated at from two to three years, according to the usage it receives. Exact determinations as to cost have not yet been made, but it is estimated at 1.2 cents per car-mile. As to the practical and economical value of storage batteries for tramway traction, the opinion is expressed that the overhead trolley is, and probably always will be, the most economical, but that the mixed system is of great value where the trolley cannot be used throughout.

To the question asking for the advantages and disadvantages of the different systems of electric traction, but three companies made reply; two use the overhead system and pronounce it satisfactory, but are unable to make com-

parisons; the third company comments on aesthetic objections to the overhead wires in the streets, but says that the other systems cost more to install and (especially with accumulators) the cost of operation is greater.

In response to the inquiry as to new developments in motors for mechanical traction, M. Lachmann, of Hamburg, presented an illustrated description of polyphase systems for railways as follows:

In the underground conduit, which is of the air-chamber type, the contact wires are in lengths of 3 meters (about 10 ft.) with longitudinal intervals of 300 mm. (1 ft.) between them. Each of these contact wires is connected to the third

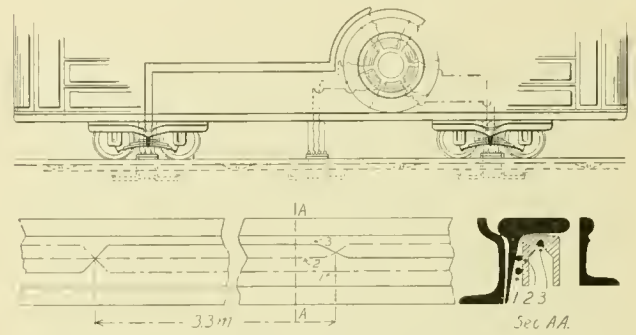


FIG. 1.

one from it by a cable passing outside of the air chamber, so that there are a succession of groups of sections; in each of the three conductor wires constituting a section is one of the three currents. The arrangement is made clear by an inspection of Fig. 1, which shows the system diagrammatically; the full line and the two dotted lines indicate the three currents.

It is of course necessary, as shown in the sketch of the car, Fig. 1, to have three pairs of contact shoes on the car so arranged that only one set will at any time come in the intervals of 1 ft. between two conduit conductor sections. The arrangement of contact shoes is such that the magnetic field of the motor may have six poles. When the car advances the magnetic field advances by intervals of 1-6 of a revolution in the direction of rotation, and consequently the movement of the car causes the current to produce a rotating field.

The question has been raised as to whether serious difficulties would not arise because of sparking at the contact shoes, but the trials show that such is not the case. It is

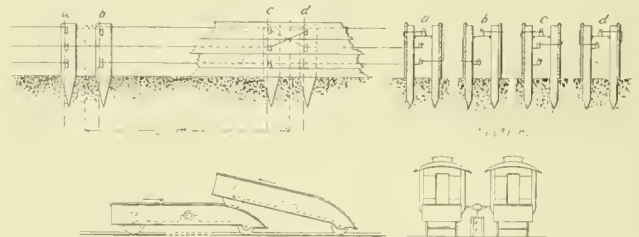


FIG. 2.

possible by this arrangement of conductors to employ polyphase currents in underground conduits without increasing the dimensions of the conduit or using the rails to carry currents. The trials have also demonstrated that a polyphase



current of 1,000 volts is the equivalent, in point of view of electrolytic action, of a continuous current of 250 volts, so that a polyphase current of 2,000 volts might be used without increasing the present danger from electrolysis.

In Fig. 2 is shown the arrangement for a double track line when the conductors are placed between the two tracks. The three wires are placed one above the other, and arranged so that each one in turn is at the top for a distance of 19.5 m. (64 ft.), and the different sections so formed are separated by a distance of .5 m. This section length of 20 m. requires that the train be 40 m. long. Current is taken from the top wire only by means of six contact carriages spaced at proper distances along the train. A single line suffices for the two tracks, since the trolley shoes are designed to permit two of them to pass on the same line as shown in the lower part of Fig. 2. The height of the top wire above the surface of the ground is 1 m.

This plan admits of furnishing each car in the train with its own motor. In this case each car might, if necessary, operate alone, it being understood that two conductors of the current would suffice and that the rails could be used for a return. For switching, etc., in the stations it is necessary in any event to use a special locomotive, either steam or storage battery, to avoid complications at the switches.

Figs. 3 and 4 show the arrangement for an overhead trolley line; Fig. 3 gives the general scheme for a double track line, in which the poles are spaced 40 m. (131 ft.) apart, making the length of the conductor sections also 40 m.; Fig. 4 shows the motor connection when all six shoes are taking

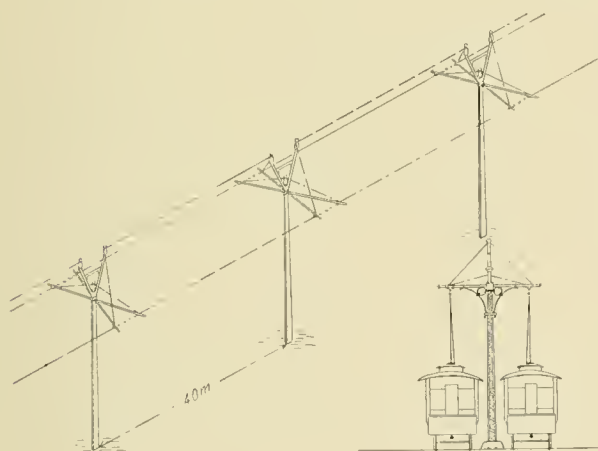


FIG. 3.

current and when three of them are for the instant dead in passing the section insulators. In the several illustrations the three kinds of lines are used to denote the three currents.

The train length necessary with the installation in Fig. 3 is 85 m.

By this arrangement of the different currents one behind the others, it is impossible to produce a short circuit by the trolley leaving the wire, while an accident of this sort could very easily occur with parallel conductors, particularly at switches and crossings. The installations of the conduit at switches and crossings are very simple and the initial cost of the whole conduit, because of the economy in the use of copper, is only about one-third the cost of a continuous current installation. Also because of the saving in metal, the cost of the central station for generating a polyphase cur-

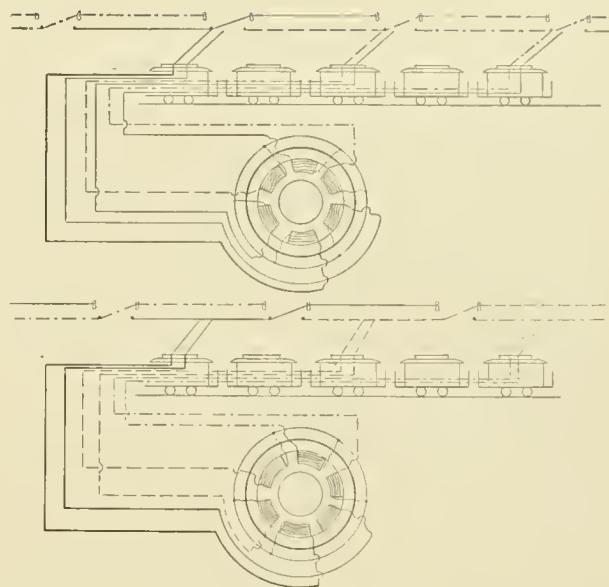


FIG. 4.

rent at 2,000 volts will be one-third less than the cost of a station to generate continuous currents at 500 volts.

The operation of trunk lines of railways by this system at a potential of 2,000 volts is possible at the present time.

#### A 3-CENT RATE IN MARYLAND.

A bill has been introduced in the Maryland legislature which provides for 3-cent fares for those passengers on street railways who are obliged to stand by reason of the seats being all occupied. Such legislation is prompted by the belief that street railway companies keep the supply of cars below the demand through a parsimonious policy; while the fact is, people ride in a crowded car because they refuse to spend any time in waiting for one that offers more room. Unless the profits of street railways are greater in Maryland than in other parts of the country the only effect of such legislation would be to reduce receipts, resulting in a further reduction in the number of cars because of poverty, and also cause friction between the fare collector and the public.

#### CONSOLIDATION IN OAKLAND, CAL.

The Oakland Consolidated Street Railway Company, the Central Avenue Railway Company and the Alameda, Oakland & Piedmont Electric Railroad Company, all under the control of the Realty Syndicate, have been consolidated. The articles of incorporation place the capital stock at \$5,000,000 and made F. M. Smith, E. A. Heron, F. C. Havens, W. H. Martin, D. D. Harris, J. C. Winans and C. R. Bishop directors for the ensuing year. The Piedmont and 8th street lines will soon be merged into the same company. The change will bring about a number of important improvements. Repairs are being made to the track, roadbed and rolling stock, and plans are now under consideration for generating the current at one power station and distributing it economically.

The Portsmouth (N. H.), Kittery & York Electric Railway Company has put a mail and express car in service on its line.





dition of service. From time to time the bulletins are posted on the boards at the five depots directing the men in reference to their conduct and duties. When an employe performs his regular duties or any special act worthy of commendation a record is made in the same manner as in an offense.

The rules governing the employes go into minute detail and are sufficiently clear for anyone to understand. When taking the car from the barn it is the duty of the motorman to carefully inspect the brakes and electrical equipment. Each motorman must provide himself with a monkey wrench, a pair of pliers, screw driver, oil can, 5 ft. of insulated wire, two extra lamps and fuses. This equipment is necessary for such slight repairs to the electrical equipment the motorman will have to make. In handling the controller specific instructions are given. Of the 10 notches the first four and the last three are the only running points and at least 10 seconds must elapse in passing to the last notch.

Caution is given against starting the cars when ladies' dresses are not entirely free from the car; no car should be run past a school house faster than four miles an hour; the car must not be run in the wrong direction until the conductor has gone far enough ahead to warn any approaching car; the motor car should not be nearer a car or vehicle ahead than a safe stopping distance. In case of accident the car is stopped at once and the name and residence of the injured party ascertained. Necessary assistance is rendered, and, if the case is serious, the conductor telephones at once to the superintendent's office. Witness cards are kept by every conductor and the name and address of witnesses must be obtained in their own hand writing. At the end of the day the following form is filled out, and with the witness cards attached is sent to the superintendent:

An accident occurred this day in connection with my car, the circumstances of which are as follows:

.....Depot. Date.....189... Time.....M.  
 No. of Car..... No. of Motor Car.....  
 Nos. of all other Cars in train.....Line.....  
 Direction Train was going.....  
 Place of Accident.....  
 Speed of Train.....On what Notch.....  
 How long had you been running on that Notch?.....  
 Was Motor in good condition?.....  
 Type of Motor.....  
 Was Brake in good order?.....  
 Condition of Track, slippery or not?.....  
 If Collision, give direction and rate of speed other Car or Vehicle was moving.....  
 If Collision, did you reverse?.....If so, how many Notches?.....  
 If not, why not?.....  
 Any other Train concerned in accident?.....Whose?.....  
 Were one or both Motormen ringing the gong?.....  
 Damage to Car.....No. of Car Damaged.....  
 Damage to Vehicle.....  
 Owner of Vehicle.....  
 Injury to Person.....  
 Name of Person.....  
 Residence.....  
 Position of Motorman and Conductor just before time of accident.....  
 Name and residence of witnesses on car.....  
 Name and residence of witnesses on the sidewalk, or elsewhere.....  
 Remarks:—State fully every fact not included above.....  
 Signature.....Conductor, Badge No.....  
 .....Motorman, Badge No.....

These reports also go before the Commission on Discipline and if gross carelessness has been shown by the em-

ployes they are punished. In cases of damage to property, the employes responsible for it are sometimes required to pay half the damage, there being a deposit of \$50 to cover this.

The conductors are in charge of the cars and are held responsible for the signals to the motormen. At the end of the day's work the conductor turns into the receiver the receipts of the day. The subject of accidents is carefully treated for it requires the utmost diligence on the part of both conductors and motormen to avoid collisions in the crowded thoroughfares, and protect passengers. The majority of accidents occur by passengers falling while boarding or alighting from the cars.

## THE BICYCLE IN WOONSOCKET.

Quite recently a bicyclist who came in collision with one of the cars of the Woonsocket (R. I.) Street Railway Company was awarded \$8,000 damages for injuries received. The company feeling that it must effectually guard against a repetition of such an occurrence issued an order directing motormen "to stop all cars when within a distance of 100 ft. of a moving bicycle approaching a car."

The result of this order is that a small boy in an obstinate mood may easily blockade about all the street cars in the northern part of Rhode Island and adjoining Massachusetts. On March 11, when the order went into effect, the situation was described by the local papers as "humorous (for the cyclist) and lingering (for the passenger);" conductors faithfully obeyed the order and passengers missed their trains.

No doubt the public will grow tired of the extraordinary care which the large verdict for damages makes it necessary for the company to henceforth use in the operation of its cars, and will find a way to keep the wheelmen off of the car tracks.

## THE STEVER RAIL JOINT.

It is now pretty generally conceded that the use of the deep rail has not obviated joint troubles. Results show that while heavy channel bars hold up rail ends more satisfactorily than was possible in chair rail constructions, there is still the tendency to work loose and out, thus involving the tearing up of pavement. Some five years ago, when chair rail construction began to prove such a universal failure, the Stever joint was first used in street railway work, and although handicapped by the fact that in many instances the rail itself was too light for the service imposed, there is yet to be reported the first case wherein one of the thousands so applied has received the least attention or caused a particle of expense.

The claims which the Stever Rail Joint Company makes for its joints are: 1. That it has a larger cross section at the rail end than the rail itself, and is therefore stronger. 2. That the bottom support augmented by two rigid jaw clamps, enclosing almost the entire base of the rail, receives the stresses and allows the bolts to perform their only legitimate duty, which is to hold the joint plates to their work. The first claim is strength and the second is keeping that strength permanently where the stress comes.

## THE PROTECTION OF GRADE CROSSINGS.

In recent issues of the REVIEW we have given a brief summary of the statutes in force in different states regulating the crossings of street railways with steam railroads, and prescribing the conditions under which grade crossings are to be permitted. A crossing being permitted to be made at grade, the legislatures of Ohio and Indiana have enacted that, so far as lines built in the future are concerned, the junior road shall be compelled to "interlock" the crossing. In regard to existing roads the provisions of these statutes are for "interlocking or other safety devices," and perhaps it would be held that the section as to new roads permits the alternative "other safety device."

A number of states, Colorado, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Mississippi, New York, Ohio, Texas and Wisconsin, have laws concerning establishing interlocking plants at the crossings of two steam roads. Of these statutes several are merely permissive and provide when such apparatus is installed the roads shall be exempted from the laws requiring stops or reduction of speed at crossings; others make the installation obligatory when it is demanded by one of two existing roads. In Illinois, Indiana and Ohio, the statutes are mandatory as regards roads to be hereafter built, and place all the cost of building and maintenance on the junior road; in Iowa the crossing may be demanded by the senior road and the first cost is to be borne by the junior road, but the cost of maintenance to be apportioned between them. Only Indiana and Ohio, as before mentioned, place electric railways under the same obligation as steam roads. Some of the newer electric railway companies in Illinois have been incorporated under the general railroad law in order to get a franchise for carrying freight on interurban lines, and this no doubt subjects them to the provisions of the interlocking law.

What is believed to be the first interlocking plant at a crossing of a steam and an electric road in which the trolley circuit was included in the interlocking mechanism, was placed in operation November 5, 1893, at the crossing of the Chicago North Shore Electric Railway and the Chicago, Milwaukee & St. Paul. This plant was described in the REVIEW for November, 1893, page 729, and the electrical portion is known as the Gibbs system.

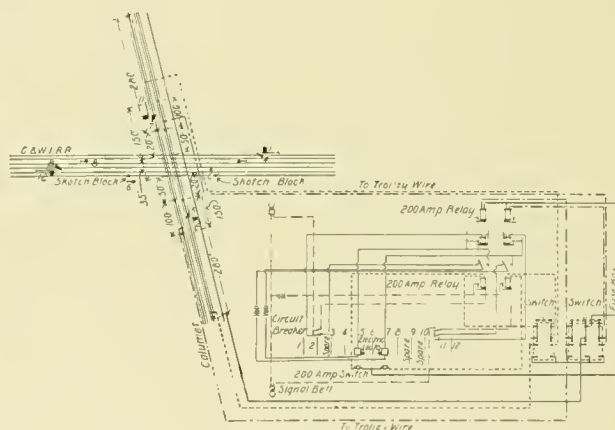
A section of the trolley wire on each of the approaching tracks is separated from the rest of the line by section insulators, and the feeders for these sections are led through the signal tower. When the gates are open the current is on these sections; at the same time the home signal on the steam line is at danger and a derailing switch, 400 ft. back from the crossing, opened. The distant signal, 1,800 ft. away, is also set at danger. When the towerman wishes to close the derailing switch he must first open the trolley circuit, close the gates, and raise a skotch block on the street railway track. The trolley wire immediately above the crossing is never cut out, as it is important that a car on the crossing may always be able to move off of it. The only accident that could occur with this would be by the opening of the steam road with a disabled street car on the crossing.

Several interlocking plants have been installed in Chicago, one at Catlettsburg, Ky., five on the Nassau Electric Railroad in Brooklyn, and one in Buffalo.

The shunting of the current from sections of the trolley wire is the principal feature of the Gibbs system, which is applied by the different signal companies to their interlocking apparatus. The several elements as mentioned above of these interlocking plants are: 1. Distant and home signals and derailing switches on the steam lines. 2. Signals (usually home signals only) and skotch blocks (or derailing switches) on the electric line. 3. The interlocking of the levers controlling these switches and signals with levers controlling the trolley current in sections of the overhead line either side of the crossing.

The details of operation of a double track crossing plant are given below and the arrangement of the electric circuits is shown in the diagram. The details of the circuits will of course vary somewhat in different cases, but in general they are the same.

In October, 1897, the Calumet Electric Street Railway and the Chicago & Western Indiana Railroad jointly installed an automatic and electrically controlled interlocking plant where the two lines cross at Kensington, Ill.; the work was completed and the plant put in operation No-



WIRING OF KENSINGTON PLANT.

ember 15, 1897. This crossing is a particularly dangerous one, the street in which the Calumet tracks are laid sloping toward the railroad from both directions; the grades are 3 per cent on both sides, one being 400 ft. and the other 600 ft. long.

The location of the signals and the arrangement of the electric circuits are shown in the diagram. It has been found best to keep the railroad blocked except when cleared for a train and the street kept clear. One of the three steam tracks is a siding and skotch blocks only are provided at the crossing.

If a car arrive from the north on the south-bound track, it passes over a circuit breaker about 300 ft. from the crossing and enters an insulated section of trolley wire. The controller is left on for say 20 ft. while on this section and then the car is brought to a standstill. By referring to the diagram it will be seen that this has drawn the current from the feeder in the switching tower through a 200-ampere relay back to the trolley section, down the trolley pole through the motors to the ground, completing the circuit. This relay throws in a local battery, which rings the signal bell in the tower. The signalman then drops the semaphore, which has been perviously kept locked. The dropping of the semaphore, which is 150 ft. from the crossing, has auto-



matically locked the whole system, and it is impossible to take the signal away or open any other switch until the car has passed beyond the crossing. The motorman now has the right of way. Within 20 ft. of the crossing he meets another circuit breaker and has now entered a section which crosses the railroad and goes beyond for about 50 ft., being fed from the main feeder and having no connection with the tower or any mechanism whatever, so there will be no danger of a car ever being stalled on the crossing by the tower apparatus getting out of order or failing to work. After passing over this section he enters a third section about 100 ft. long. While going over this, which is upgrade, he has to use the current which is drawn from the tower through the auxiliary feeder that passes through a 200-ampere relay, which operates a local battery and a second relay which unlocks, electrically, the levers in the tower. The towerman is now able to set any switch that is called for.

The north-bound track is operated in a similar manner.

When the railroad has the right of way the street car semaphore stands at block and both derails are thrown open, and until both derails of the street car lines are open it is impossible to close any on the railroad, they being governed by the interlocking mechanism. Having closed the railroad derail and given the right of way, it is impossible to operate the street car lines, which remains blocked until the train has passed.

Should the electrical apparatus in the tower from any cause get out of order or fail to act, there is a set of switches on the local battery circuit that can be thrown over in order to release the locks, leaving the levers free to act.

These switches are enclosed in a locked box with a glass front and the towerman can only get at them by breaking the glass. He then notifies the main office to send men to make the necessary repairs, with an explanation and full report of the cause that led to the necessity of breaking the box. He has then also to throw over two large double

and as an improvement on the present arrangement the latter suggests the following: "Instead of the street car derail being closed and the first or signal section being in circuit in series with a 200-ampere relay, which allows a motorman—if he choose to disobey the semaphore signal to continue and pass over the crossing—my idea would be to have the derail wide open and the trolley section dead, with the exception of passing through a very high resistance relay, sufficient only for signal purposes, but would not allow sufficient current to move the car.

"Now, under these conditions, the towerman having received the signal, would first have to throw the derail switch

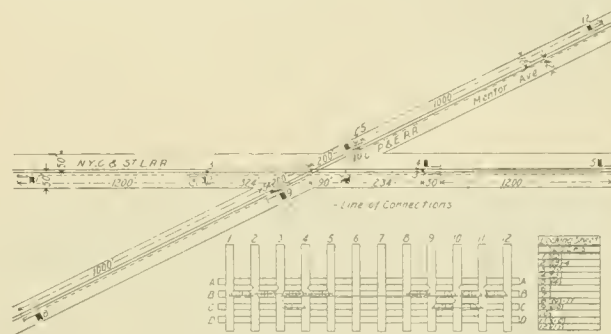
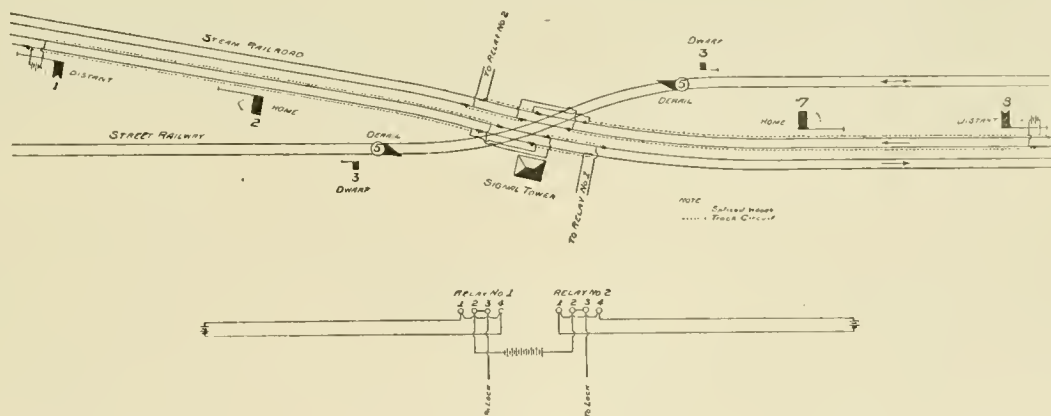


DIAGRAM OF PAINESVILLE CROSSING.

which would, at the same time, throw the trolley section into circuit, following up with the semaphore. With this arrangement a motorman would be compelled to obey the semaphore at all times or he would himself derail his car."

The first crossing of an electric line with a steam road in Ohio to be interlocked, in accordance with the crossing law, was that of the Cleveland, Painesville & Eastern Railroad with the New York, Chicago & St. Louis Railroad (Lake Shore) at Painesville, which was put in operation in February last. Both of the roads are single track; both are



FOR CROSSING WITHOUT TOWERMAN.

throw switches, which release the several insulated trolley sections from the tower apparatus and short-circuit them on to the main trolley feeder, practically making it a continuous trolley wire. The signalling is then done by hand. During the operation of this plant this has only been resorted to once, and this was practically while under test.

The foregoing description was furnished by General Manager Sloan and Master Mechanic Harding, of the Calumet,

provided with home and distant signals and derails, the same as are usually provided for the crossings of two steam roads. The diagram, which was furnished by the courtesy of H. M. Sperry, shows the layout; there are practically no grades near the crossing. The wiring is similar to that in the Kensington plant, the insulated trolley sections taking current through the regular trolley relays of 200 amperes capacity; in operation, however, the derail on the

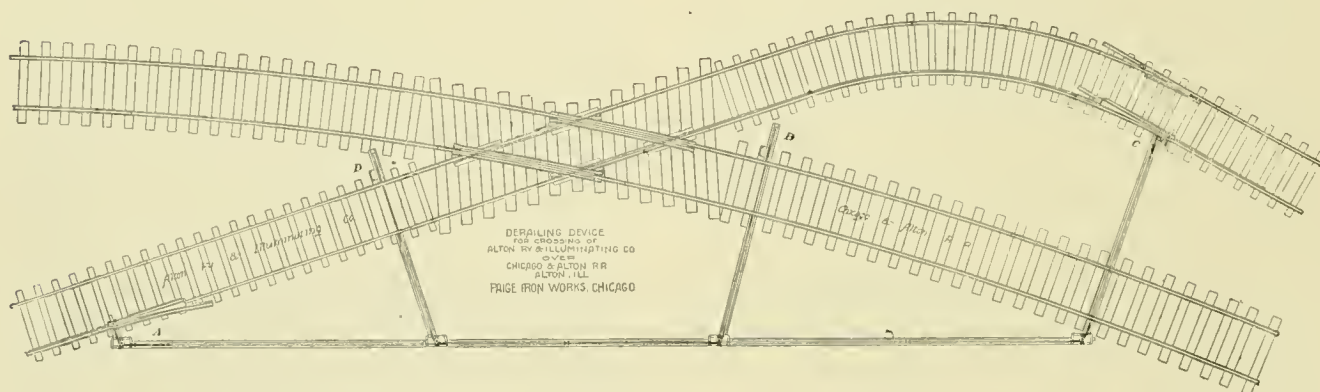
electric line is kept open, so that if the motorman disregards the semaphore he derails his car.

For crossings outside of thickly settled areas where there are few trains one of the signal companies has designed a system which protects the two tracks and reduces the expense to a minimum. The diagram shows a single track crossing two main tracks of a steam road. The regular high semaphore signals, 1, 2, 7 and 8, are placed on the steam railroad. The home signals, 2 and 7, are located about 300 ft. in advance of the crossing, and the distant signals, 1 and 8, are from 1,200 to 1,500 ft. in advance of the home signals. The street railway has two derails 5, and two dwarf semaphore signals 3.

The normal position of signals 1, 2, 7 and 8 is at clear, as shown by the broken lines, the levers in the machine being

One of the plans for protecting grade crossings which is simple and inexpensive is to provide derails on the street railway track which are normally open and are closed by the movement of a lever which is located on the opposite side of the steam track from the derail. The conductor of the street car must cross the steam track and close the derail before the car can proceed. Such an arrangement is in use in Denver and was illustrated in the REVIEW, June, 1897; at the crossings there described blind curves are provided onto which the street car runs, instead of merely being derailed.

The accompanying illustration shows the derailing device made by the Paige Iron Works, of Chicago, and installed at a crossing of the Chicago & Alton Railroad and the Alton Railway & Illuminating Company's road at Alton,



DERAILING DEVICE FOR PROTECTING STREET AND STEAM RAILWAY CROSSING AT ALTON, ILL.

reversed, giving the right of way for trains on the steam road. The normal position of signals 3 on the street railway is at danger, the lever being in normal position, toward the front of the machine, with the derails 5 open.

As it is not intended to employ the regular services of a signalman in a tower to manipulate the levers, but to have them thrown by the conductor of the electric car, it is desirable to arrange the interlocking mechanism so that he cannot change the position of the signals 2 or 7 after a train on the steam road has passed either 1 or 8, for unless this protection were provided, he might change signals 2 and 7 immediately in front of a fast approaching train, and cause a collision, the distance between the home signals and the crossing not being sufficient in which to stop a train that has passed the home signal at speed.

This is accomplished by forming a rail circuit from the distant signals to a point beyond the crossing, as shown by broken lines, from which it is carried to relays in the tower. The third post of the relays is connected to a lock. The interruption of the rail circuit by the short-circuit through the axles of the train causes the locking of the machine, which is not released till the train has passed beyond the crossing.

Another important point is the interlocking of the door of the cabin with the signals, so that the conductor cannot leave the cabin until he has reset the levers to their normal positions. This prevents delays on the steam road which might occur were the conductor to leave the signals set at danger.

III. A hand-operated derailing switch is placed on each side of the steam track and about 50 ft. distant. The lever B operates the switch A, and the lever D the switch C.

### PREPARING FOR THE TRANS-MISSISSIPPI EXPOSITION.

The Omaha & Council Bluffs Railway & Bridge Company is making extensive additions to its equipment in preparation for the Trans-Mississippi Exposition. Contracts have been closed with the General Electric Company for 17 equipments of 57 motors to be placed under 43-ft. cars. A new power house will also be erected. Two 280-h. p. Cahall-Babcock & Wilcox boilers, a 325-k. w. direct connected generator with a Reynolds corliss engine and switchboard have been purchased.

One important question has been a water supply, and this has been solved by sinking two wells. They supply about 50,000 gals. of water per hour. The wells are 75 ft. deep and reach the bed rock of the Missouri river, giving the same character of water as has been supplied from the city mains, but free from mud and dirt. It is clear, has a low temperature and has been used in the boilers over a month with good results. It is intended to run the new engine condensing. As the water comes within 8 ft. of the surface the expense of pumping is trivial. With these added facilities for handling a heavy traffic General Superintendent Dimmock believes that the company can carry all the visitors that may come to see the Exposition.



### IA FLORAL TROLLEY PARTY.

The second anniversary of the organization of the New Orleans Traction Company's Employes' Aid Association was made the occasion of a trolley parade which was as beautiful as it was unique. The association has branches in each of the company's barns and it was arranged that each branch was to display one car decorated with bunting and flowers. The rivalry was very keen but each employe was familiar with the appearance only of his own car until all of them met on Canal street at seven p. m. on March 25. A large crowd assembled and shouted their appreciation as the decorated cars passed with a few cars carrying passengers interspersed.

In each car was a band of music and the marshal and aids of the different branches. Others had men attired in dis-

included a large number of ladies, who had been invited by the members.

Secretary A. H. Ford, of the association, bade the guests of Arabella branch a cordial welcome, and then called upon C. D. Wyman, general manager of the company, to address the employes. Mr. Wyman made a splendid address, which conveyed expressions of congratulations and encouragement of the noble work. He showed that he was heart and soul with them in their pleasures, as he was when their interests were at stake. His speech was received with cheers, and then the fun commenced.

There are in the city seven different branches of the association, one at the Arabella barn, one at the Magazine barn, one at the Prytania barn, one at Poland street station, one at Esplanade street barn, one at the Tchoupitoulas barn, and one at the Canal street car station.



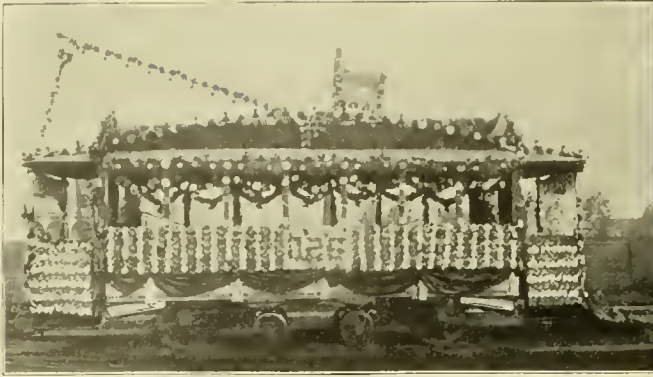
CAR OF CANAL BRANCH, NEW ORLEANS TRACTION COMPANY'S EMPLOYES' AID ASSOCIATION.

guises, which added to the enjoyment of the scene. They proceeded down Rampart street to Esplanade, thence out to Dauphine, and down to Poland street and out to the station. After remaining there a few moments to afford the people an opportunity of closely examining each car, the procession moved up Rampart street to Canal, thence to Camp and up to Newspaper row, where each car stopped and serenaded the various newspaper offices. The approach of the procession was heralded by the discharge of rockets, bombs and cannon crackers, while one of the delegations had a small brass cannon.

The cars proceeded to the Arabella barn which is the terminus of the route, and here the Arabella branch became the host, and entertained their brethren and gave them a glorious time. Refreshments of all kinds were served to the guests, and the members of the Arabella branch showed themselves to be splendid hosts and entertainers. A fine programme had been arranged for the assemblage, which

The exhibit of the Arabella branch was an open summer car most artistically decorated, the design being "Louisiana." Cotton, sugar, Spanish moss and latanier or palmetto constituted the principal portion of the decorations, to say nothing of a wealth of roses and sweet blossoms gathered from the numerous splendid gardens which line the routes of the various lines which have termini in the Arabella barn. The fenders were beds of Spanish moss and roses, while each post of the car was covered with Spanish moss, in which cotton bolls were liberally scattered, giving the decorations a most beautiful and appropriate appearance. Flags and hunting were displayed in profusion all around the sides and ends of the car, while two rows of Chinese lanterns were suspended on each side of the interior. The side step was a bed of moss and roses, while a garland of moss extended all around the car. The interior was brilliantly illuminated with incandescent lamps having vari-colored bulbs, and in front and rear, instead of the headlight, was a cluster of elec-





POLAND BRANCH



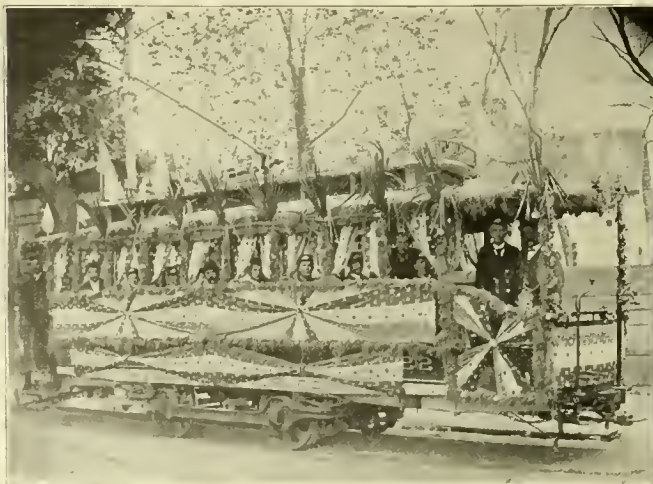
MAGAZINE BRANCH.

tric lights which formed the letter "A." At each end, in front and on top of the car, was a large transparency bearing the word "Louisiana."

The car from the Poland street branch seemed to meet with the approval of the majority of the people who witnessed the parade and who declared it the most beautiful of all. That it was a most gorgeously decorated as well as artistically illuminated car was beyond cavil, and it expressed the taste, skill and novel ideas of the designer. The car, as was the other, was an open car, and was surrounded by a red cloth, which formed the groundwork of color. Red and white roses made of paper, with a large number of bouquets of natural flowers, surrounded the car. The posts were covered with red cloth, decorated with flowers, in accord with the remainder. Festoons extended from end to end of the car and across the ceiling, composed of Spanish moss, into which roses had been entwined with twigs of cedar. The fender at each end was a bed of moss, in which roses, cedar and sprigs of heliotrope and other plants had been placed. The lights, 209 in number, were arranged in arches around the sides and front of the roof, while the base of these arches was a line of red and white lights. In lieu of a headlight at each end there was a large circle of white lights, in which was a letter "P" made with red lights. All around the edges of the fenders was a fringe of red and white lights, while along the trolley pole was a row of alternate red and white incandescent

lights. On the way up to Canal street, the Poland branch proceeded to the residence of General Manager Wyman, and presented Mrs. Wyman with a magnificent bouquet of rare flowers and ferns.

The Canal street car was in many respects equally attractive. Although the illumination was not quite as elaborate, the decorations were in every other respect as pretty, and many appeared to prefer them to the other. The subject of the decoration was "Liberty and Commerce," exemplified by appropriate designs and decorations. Red, white and blue lights surrounded the car, while in the seats in the center of the car, and facing each other, was a boy attired in the traditional costume of "Uncle Sam," and a beautiful little girl, attired as the "Goddess of Liberty." Between them was a yacht, full-rigged and with all her courses set, a good imitation of the Defender. The seats were covered with the national flag and on the front fender was a brass howitzer upon a bed of roses. The interior of the car was decorated with festoons of white garlands, extending across the car and from front to rear. Red, white and blue lights illuminated the interior, and each of the posts were elaborately decorated with bunting and entwined with moss, flowers, etc. At each end was a transparency with the words "Our Country" in large letters. Palmetto moss and flowers ornamented the roof of the car and the trolley pole was decorated with small flags and electric lights.



ESPLANADE BRANCH.



ARABELLA BRANCH.



The car of the Esplanade branch represented "Spring." Red, white and blue bunting, interspersed with stars, was artistically draped around this car, while moss roses and palmettoes constituted the remainder of the decorations. The effect was very handsome. Small flags and lanterns formed the interior decorations while numerous bouquets of natural flowers were suspended from the ceiling.

The car of the Magazine branch, the most beautiful of all, with a wealth and profusion of brilliant colors and quantities of natural flowers. The fender was raised in the center so that it resembled the pilot of a locomotive. It was a solid triangular pyramid of choice roses, with electric lights scattered amidst the bed, giving a most beautiful effect. The dashboard at each end was a mass of flowers, white at either end on top of the car, there was a solid arch of flowers, as well as along the sides of the roof. In front and rear, in the way of illumination, was a crescent and star of electric lamps, the crescent being formed in white lights and the star in red. In the middle of each side was a small cluster of white incandescent lights, but the illumination was not quite brilliant enough to set off the really elegant floral decorations of the car. A transparency with the words, "Magazine Branch of the New Orleans Traction Company's Employees' Aid Association," was at either end. On the glass of the headlight was painted a large sunflower. The band on this car is known as the traction band, composed of employes of the company.

The Annunciation and Tchoupitoulas employes selected as a subject "Audubon." The fender of the car was decorated with moss, in which innumerable cotton bolls had been scattered. A deer's antlers were placed over the center of the fender at one end and a handsome pair of horns at the other. Flags and Chinese lanterns were suspended from the ceiling inside the car, and in front a large transparency with the word "Annunciation" was stretched across the car from side to side. Around the top of the car were innumerable small flags crossed in beds of palmetto moss and cotton. The posts were decorated in keeping with the remainder of the decorations.

"Liberty" was represented by the car of the Prytania branch. The national colors predominated everywhere about the car, with red, white and blue lights. A large letter "P," formed with white lights, was at each end of the car, while the fenders were decorated with moss and flowers.

Upon the approach of the procession of cars at the Arabella barn there was another grand display of fireworks, with a discharge of bombs, cannon, crackers, etc. The cars were all run into the spacious barn and switched on side tracks. The men then alighted and went to the rear end of the barn, where a stage had been erected. On each track leading to the stage summer cars had been placed, and these afforded the audience seats from which to view the performance with which the Arabella branch entertained its guests. A brass band furnished the music.

The audience was a very large one, and every available space was occupied. The entertainment was a success in every particular.

March 19 the springs on the governor of an engine in the power house of the Glenwood & Polytechnic College Street Railway at Fort Worth, Tex., broke, and in consequence the two 5-ton fly-wheels burst, wrecking the building and injuring one man.

## POSTAL CARS IN PITTSBURG.

Tracks have been laid in Pittsburg to connect the lines of the Consolidated and the United Traction Companies, and a switch for the accommodation of the postoffice, in preparation for the postal cars which are soon to be put in service. Two postal cars are now building after designs furnished by the Government, and they will carry crews of postal clerks and run over extensive routes. The use of the two cars is said to be in the nature of an experiment, but in view of the experience in other cities there does not appear to be much doubt but that the number will be soon increased.

## THAT FENDER QUESTION.

EDITOR REVIEW:

We are in the midst of a fender controversy, and while I recognize the merits of one or two fenders which I consider good, we have been simply inundated with a swarm of contraptions which the inventors call fenders, until I have been reduced to the desperate condition indicated below:

It is fenders in the morning,  
 And it's fenders noon and night;  
 It is fenders with projections,  
 And fenders out of sight.  
 But the fender which I most need—  
 I'll buy one if I can—  
 Is the fender that will fend me  
 From the fender selling man.

MANAGER.

## A NEW ROAD IN CONNECTICUT.

In Connecticut the projectors of an electric railway have the burden of proving to the satisfaction of the court that the proposed road is a "public convenience and necessity," before it can be built. There is now a contest pending between the promoters of an electric line through the towns of Montville and Waterford to connect New London and Norwich, about 20 miles, and the Central Vermont Railroad, which would be paralleled. The hearing had been set for March 29, but was postponed till April 27 at the request of the Central Vermont, which asked for more time to prepare its case. There are rumors of the latter putting down a third rail and adopting electricity between these cities.

## STRIKE AT SAGINAW.

On March 11 the 62 motormen and conductors of the Union Street Railway, of Saginaw, Mich., went out on a demand for shorter hours. The men set forth that when the pay was recently raised from \$1.34 to \$1.55 per day the hours of labor were increased to 12 and 14, and in some cases 16 hours per day. This road will be remembered as having made quite a figure with its low rates of seven and nine rides for 25 cents. The daily press generously praised the announcement as evidence of what a well-managed road can do if it only will. The trip into receivers' hands was both short and swift, and the long hours were simply a heroic effort to do the best they could with a hard proposition. The strike was settled by a reduction in the hours and maintaining the \$1.55 rate, which was only made possible by the court authorizing a change in fares by increasing the price of tickets.

## STREET RAILWAYS IN PUBLIC HIGHWAYS.

Extract from Report of Secretary of Massachusetts Committee—Effect Upon Density of Urban Population—Locations in Public Highways—Maximum Life of Franchises in Different Jurisdictions—Method of Forming Company and Securing Location in the Street in America and in Europe.

In the REVIEW for January we published a portion of the argument of Everett W. Burdette, before the special committee on the "Relations of Street Railway and Municipal Corporations in Massachusetts" which gave in detail the growth of the street railways in that state, their status in the highway, and the burdens borne by them in the shape of taxes. In February, we published the text of the "Report" which discussed the various questions treated with a view to their bearing on the street railways of that state. As stated in the report the committee collected a great deal of data which are to be published as appendices to the report proper when properly arranged. Three appendices have been published: A, treating of street railway legislation in Massachusetts, locations in public highways, and methods of taxation and franchise charges. B, comprising abstracts of the statutes of various states. C, giving the conditions in various American cities. The following is a copious extract from the report of the secretary which is Appendix A.

Since 1887 the relations existing between the railways and the municipalities and the railways and the public have changed with great rapidity. Formerly the street car was a small affair, drawn by one or two horses, moving at a speed of not to exceed eight or ten miles an hour; now we have large cars, moving at high rates of speed, often exceeding 25 miles per hour when away from the crowded streets of the city. The most important result of the introduction of electricity as a motive power was undoubtedly this increase in speed, which led directly to a great increase in the area served within a given time. It may be assumed that one hour represents the limit to which people are restricted as the time to be spent on the journey from house to work; that is, the limit of the availability of the suburban district as a place of residence. A street car drawn by horses moving at the rate of eight miles per hour could serve an area of 200 square miles, within which people might reach the center of a district by one hour's travel. With electric power and the speed of the cars reaching an average of 15 miles an hour the area which can be served within an hour's journey from the central point reaches 700 square miles, or three and one-half times as great as was the case when horses were employed.

The spread of population due to this increased speed of transit has been very marked, and many benefits accrue therefrom. Instead of being obliged to reside within limited areas, where land is expensive, and rents consequently high, the population may be spread out into districts where land is of less value, and where each house may stand detached from its neighbors. This spread of population over a larger area is also a great advantage to the street railways; for, when people lived within limited urban areas the majority of them were able to walk to and from their work, but now the railways obtain a steady patronage from those who desire to live outside of the heart of the cities beyond walking distance, and must therefore use the railway cars at least twice in each day. Another class which benefits greatly by rapid street car service is the land owner, who finds his fields commanding prices greatly in excess of any which could be obtained for them for agricultural purposes.

As time went on, these suburban street railways were extended; lines starting from different centers of population were connected, and in this way the interurban lines were created. These lines, giving frequent and rapid service between the cities and towns, hold a position in the transportation of passengers similar to, but yet different from, that of the steam railroads. They operate single cars at frequent intervals, making stops at any point at which a passenger wishes to get off or on, and serve more conveniently those people living along the main highways in which such cars are run than do the cars of the steam railroads. On the other hand, the speed being less than that of the steam

railroad and the number of stops very much greater, the time consumed in the journey is often excessive; and a natural limitation is placed on the use of street railways by those whose time is more valuable than the increased convenience due to ready accessibility.

On the street railways the rates of fare are generally lower than on the steam roads for the same distance, since street railway rates are not, as a rule, governed by the distance run. In the case of suburban and interurban lines rates are often established merely by the town boundaries—a plan resting on a wholly illogical basis. It may in general be said of street railways that their rates of fare provide for a long ride for a small cost and a short ride at a relatively high cost, while the practice of steam railroads is governed by the distance travelled.

It is undoubtedly true that any passenger carried the full distance allowed by a street railway for a 5-cent fare is always carried at less than the actual cost to the road, the profit coming from those passengers who use the street cars as a luxury for a short ride, or from those to whom the saving in time in a short ride as compared with walking amounts to more than the sum paid.

Street railway fares in Europe are, on the contrary, based on the theory of the steam railroads, and the rate is governed by the distance traveled. This fundamental difference between the basis on which fares are established prevents any practical comparison between European and American rates, and all such comparisons are of extremely doubtful utility.

The employment of electrically driven cars in the suburban and rural districts, running at high rates of speed upon country roads, has presented an entirely new set of problems for the consideration of the officers of the towns; and it will be generally admitted that they have not always proved themselves capable of dealing with these questions to the advantage of all. Sometimes, in their eagerness to obtain a railway within the limits of the town, grants of locations in the public highways have been given entirely without adequate protection to the interests of the town, the officials thinking only of the benefits to be derived by the people from being placed in close communication with some neighboring town or city. Later they see their mistake, and try to make up for the error by imposing extra requirements when ever locations for extensions are desired. These new requirements may place burdens on the roads greater than fairness should demand; but when a road is already established in a portion of the town, it must make its extensions or see some syndicate build competing lines into its territory and divide the business. The original road is therefore unable to resist demands which are unjust, but which impose light burdens as compared with those imposed by the entrance of a rival, who could jeopardize the whole capital originally invested in good faith. Moreover, the increase in the business of manufacturing electric appliances and the advance in new inventions have, in these 10 years of electric railway operation, so reduced the cost of all forms of apparatus that a road may now be built and equipped for very much less than the cost of a road built only seven or eight years ago; and a new road can afford to offer greater inducements to the town than is the case with a road which, as a pioneer in the development of the industry, has as a part of its capital the cost of the experiments which have led to this marked diminution in the cost of all material. The older road, burdened with a greater capital charge, has not been able to charge off from earnings for depreciation amounts equal to the reduction in value of its equipment due to wear and tear and to reduction in cost. Most roads have attempted to charge off something, but as a rule the amount is insufficient to properly cover the depreciation.

Still worse handicapped is the road which is changed from horse to electric power. The entire plant of the horse railway has



been wiped out, leaving only the real estate and the right to use the streets. Horses, cars, tracks, buildings, in short, everything has had to be sold as old material, and be replaced with new equipment. Expensive machinery has been installed in power houses, new and heavier rails have been laid and wires and poles erected over the entire system. In the cities the demand for the removal of overhead wires has compelled in many cases the building of expensive underground conduits, through which the feeder wires must be taken. The capital represented by the abandoned horse railway system cannot be charged off all at once, and the road must drag along, writing off little by little this depreciation.

It is essential to success that low fares be charged for long rides, and this policy, demanded by the public, forbids the accumulation of any large amount of surplus which might be used for depreciation. The general condition of affairs to-day in this commonwealth and in most of the other states is this—that, apart from the roads located in the larger cities, very few street railways are making a fair return to the stockholders, and writing off anything approaching the proper amount of depreciation; in other words, the public shares with the investor the advantages of the introduction of the improved system.

Much of the friction existing between municipalities and street railways arises from the fact that the authorities in cities and towns learn that other places possibly near neighbors, have obtained more favorable conditions from the railway than they themselves; and in our modern interurban systems it often happens that grants made by different towns to the same road vary in the most essential conditions.

The law of this commonwealth allows boards of aldermen and selectmen to impose restrictions on grants of location; and this word restrictions has been very generally construed to mean conditions, and these officers have imposed conditions and compelled agreements which have in many cases exceeded the powers of the city and town, but, as others are always ready to take the grant if refused, the municipal authorities have remained unchallenged on this point. If the general law had defined accurately what class of restrictions might be imposed by the local authorities, much trouble would have been avoided.

So also with the power of revocation. It probably would never be used harshly by the local authorities to force any railway to remove rails which were serving the public; but since, recently, syndicates and promoters have stood ready to intimate to municipal officers the great benefits that might accrue to the towns if the grant in some particular street or highway should be taken from a road now in operation and the same location re-granted to a new road, the danger to capital and also to the public becomes great, and the arbitrary power of revocation probably needs restraint.

In this country these franchises, or rights to use the public ways, have been granted with great liberality; and, while this system has led to chaos in the legal relations existing between municipal corporations and street railways, this very freedom has led to an unprecedented technical development. In Europe the careful study of the problem, and the rigid restrictions imposed on railways desiring to use the streets, have led to very well defined legal relations, but have restricted technical development to such a degree that it may be said that there scarcely exists in any European country a street railway which approaches in its technical and commercial methods those of an ordinary American city. In England the general law relating to tramways has imposed such burdens that no company has felt justified in making proper extensions; and we find the development of the street railways in London and in the larger provincial cities behind that of cities in the United States with populations far smaller than those of these great towns.

On the continent the matter of grants of location rests on yet another basis. It stands purely on a formal contract, concluded between the municipality and individuals or a company. These continental contracts are invariably for a limited term of years; contain elaborate provisions as to all the details of building and operating the road; provide, so far as is possible, for all conditions which exist, or for contingencies which may hereafter arise; and usually include a clause by which, at the expiration of a given term of years, the entire property of the company be-

comes the property of the city, sometimes free of cost, but always under conditions explicitly laid down in the contract itself.

#### LOCATIONS IN PUBLIC HIGHWAYS.

The right to use the public highways for the construction and maintenance of the tracks of a street railway company is commonly spoken of as the franchise of the company. In strict legal phraseology this is not a correct name for the kind of grant which these companies receive from municipalities to enable them to carry on their business. The franchise of a company is the right which it obtains from the legislature to be a company, and, speaking accurately, these municipal grants are merely licenses to use the surface of the highways, granted by the municipalities and the authority conferred on them by the specific action of the legislature.

The use of the term franchise is now so generally understood to cover these municipal licenses that it will in this section be used in the limited and narrow sense of a grant from a municipality.

This permission to use the streets may be, and sometimes is, given directly by the legislature to a company, not through the intermediary of a municipal corporation. In this country a few of the states have required the organization of all street railway companies by special acts of the legislature, and in such cases it was formerly customary to include the grant of the use of the streets. This was the case in California, in Delaware, in Connecticut, in Maine, in North Carolina, in Oregon and in Vermont. In Connecticut and in Vermont the law has now been amended so that the plans submitted by the railways must be approved by the local authorities, and from this decision an appeal may be taken to the courts, or to the Board of Railroad Commissioners. In California local authorities must now sell the franchise by public auction. In Delaware all companies must be incorporated by special charters, and the local authorities are, in some cases, given a slight degree of control over the streets. In Oregon variations are to be found in the charters of the cities, some of which have power to control their streets, while others have never received the requisite authority from the legislature.

These grants of power made directly by the legislature have sometimes been for an indefinite period, and have not contained any reservation of the power to amend or alter the conditions. Few street railway charters exist in this form, since nearly all have been granted since 1850; and the principle of the Dartmouth College case—that a charter is a contract beyond the power of the legislature to amend, unless such power has been reserved by the terms of the original grant—has been recognized so universally that it may be said that in practically every case the power to amend, annul or repeal at the will of the legislature has been inserted in the charters. A more common practice than that of granting charters to companies of any kind for unlimited terms, reserving the power to amend or repeal, has been their creation for a term of years. In the newer states, whose constitutions are elaborate in form, containing many provisions relating to matters which in the days of the earlier constitutions were considered to be proper subjects for statutory legislation, not for the constitution, this limitation as to time is found in the constitutions.

The length of time for which a charter may be granted varies greatly in different states, and runs from 20 to 99 years. Even in those cases where the life of the charter is limited, either by constitutional provision or by statute, the power to amend or repeal is almost invariably retained by the insertion of a special clause reserving this power to the state.

Far more numerous, however, are those cases in which the legislature, instead of directly exerting its powers of control over highways, has delegated these powers to the local authorities; and either in the charters incorporating the municipalities or in the charters incorporating the street railway companies, power has been given to the local authorities to grant or withhold their consent to the use of the streets for the purpose of laying tracks. In some of the more modern constitutions this power of regulation has been granted to the local authorities by the constitution.

The grant by the local authorities may be for an indefinite period, and their power may be confined simply to refusal or consent. In such cases as, for example, in Connecticut, power is given to the



railway to appeal from the decision of the local authorities to the courts; but in the great majority of the states these franchises are granted by the municipal authorities for a term of years, the maximum term being sometimes fixed by statute and sometimes by the municipal charter. The tendency seems to be towards grants for short terms wherever such limitations are fixed.

Wyoming has restricted the powers of the cities to granting locations for a length of time not greater than 10 years. In other states the terms vary up to a maximum of 99 years.

The table shows the maximum periods for which such franchises may be granted in the several states. Except in cases where the statute makes the time during which the grant in the streets may be made less than the life of the company, these periods show the limit of the charter:

#### Maximum Terms of Franchises.

Alabama	25 years.	Nebraska <sup>1</sup>	no limit.
Arkansas	no limit.	Nevada	no limit.
Arizona	50 years.	New Hampshire	no limit.
California <sup>1</sup>	50 years.	New Jersey	no limit.
Colorado, <sup>2</sup>	25 years.	New Mexico	50 years.
Connecticut	no limit.	New York <sup>3</sup>	no limit.
Delaware	no limit.	North Carolina	60 years.
District of Columbia	no limit.	North Dakota	no limit.
Florida	no limit.	Ohio <sup>7</sup>	25 years.
Georgia <sup>2</sup>	30 years.	Oklahoma	20 years.
Illinois	50 years.	Oregon <sup>8</sup>	no limit.
Indiana	25 years.	Pennsylvania	no limit.
Iowa	25 years.	Rhode Island <sup>9</sup>	no limit.
Kansas	20 years.	South Carolina	no limit.
Kentucky	50 years.	South Dakota	20 years.
Louisiana	99 years.	Tennessee	no limit.
Maine	no limit.	Texas <sup>10</sup>	50 years.
Maryland	40 years.	Utah	50 years.
Massachusetts	no limit.	Vermont	no limit.
Michigan	30 years.	Virginia	no limit.
Minnesota	50 years.	Washington	50 years.
Mississippi	99 years.	West Virginia	50 years.
Missouri <sup>4</sup>	50 years.	Wisconsin	no limit.
Montana	20 years.	Wyoming	10 years.

<sup>1</sup> Sacramento is limited by the city charter to granting a twenty-five year term.

<sup>2</sup> Denver is limited to making a grant for twenty years.

<sup>3</sup> Special charters are often granted for fifty years.

<sup>4</sup> Unless specified in the charter, may only be for twenty years.

<sup>5</sup> Omaha has an exclusive grant for fifty years.

<sup>6</sup> The Greater New York charter limits such grants to twenty-five years, and allows a renewal for twenty-five years more.

<sup>7</sup> An extension is allowed for fifty years.

<sup>8</sup> Some city charters provide for a limitation.

<sup>9</sup> May be made exclusive for a term of twenty-five years.

<sup>10</sup> If not specified in the charter, granted for twenty years only.

In Louisiana an agreement may be made either by a notarial contract or by ordinance; and if this ordinance has been accepted by a company, it becomes a valid contract, and may not be interfered with.

It must be understood that in very many cases the municipal authorities have assumed the power, even when not specifically granted, to limit the duration of franchises in the streets to shorter terms than those expressed in the above tabulation. In Massachusetts a form of grant exists which allows revocation at the will of the local authorities.

Some municipalities have incorporated provisions in their grants, the violation of which void the franchise; and in nearly every state, either by general statutory provision or by conditions inserted in the grant from the local authorities, it is provided that the disuse of a track for a period of time, varying from three months to a year, annuls the right to maintain the track in that street, and it may be ordered immediately removed at the expense of the company. There is often a provision that, if work is not begun within a certain time after the grant has been made, the permission becomes null and void. This clause, which has been introduced in several states, is for the purpose of preventing companies from obtaining charters under which they never intend to build, but merely desire to hold rights in the streets for the purposes of sale to some other company.

In many states the consent of a majority of the abutters, either in front feet or in value, along the line of the proposed railway is requisite before the municipal authorities can grant permission to lay the tracks.

In Illinois and South Dakota this statute takes a somewhat different form from that in other states. In these states the consent must be in the form of a petition addressed to the municipal authorities, asking that a company be allowed to lay a railway through that street.

In the other states it is a consent on the part of the proprietors, given in writing. Those states in which such provisions exist in the statutes are Colorado, Kansas, New Jersey, New York, Nebraska and New Mexico.

The general plan under which an American street railway company obtains its corporate existence and its franchise in the streets is as follows: A number of persons meet together and organize a company, which then takes steps to obtain its charter. This charter is obtained from the state, either under the provisions of a general law which authorizes some state official to issue a charter when certain preliminary steps in the organization have been taken, or under a special act of the legislature. When the charter has been obtained the company is legally complete, and may elect its officers, pay in its capital, build its road, and do business under its corporate franchise; but before the road is built and operated the company must obtain its municipal franchise, and this grant fixing the conditions for the use of the streets must as a rule be accepted in writing by the company. This permission, which is usually granted in a city by the board of aldermen, is often carefully drawn up, and as a rule contains many conditions. The municipality has been given the right to regulate the use of the streets, and this right it exerts to the fullest degree; many times restrictions are inserted beyond the power of the road to fulfil. The promoters of the road are in most cases ready to accept almost any condition in order to get the chance to build, relying upon the probability of finding purchasers for their shares and bonds, and planning to get their profit out of this transaction rather than from the operation of the road. In this way much of the surplus capital found in some of our roads has been brought in; it was issued merely to enable a profit to be made by the original promoters, not to represent the cost of the road. Examples may be found where the total cost of the plant is represented by the bonds issued, and the stock stands for nothing.

In Massachusetts there has been for some years a strict supervision in regard to the issue of shares and bonds, and restrictions often considered burdensome by promoters have been imposed by the Commonwealth. Capital may now only be issued by permission of the Board of Railroad Commissioners, and must not exceed the amount of the actual property of the road. If a floating debt has been created, this must be represented by property before stock or bonds may be issued to pay off the debt. The Board has established a uniform system of accounts, and has power to compel the roads to conform to this.

The municipalities in making their grant have often inserted a great variety of conditions, but these, being in a large measure indirect forms of taxation, will be considered under that head.

The above briefly summarizes the methods employed in the United States; but in Europe entirely different methods exist, and these may be divided into two groups, that of contract and that of municipal ownership. In continental countries roads almost invariably have their rights established by the terms of a definite contract between the municipality and the company, and in England, and to a slight extent on the continent, may be found municipalities which have built or purchased the street railways within their limits.

Considering first those roads established under definite contract, we find very elaborate agreements existing, under which the rights and powers of each party are set forth explicitly. In Germany, where the system of contract is universal, these contracts or concessions enter not only into the question of the legal relations of the roads and the municipalities, and define carefully the interests of each in the surface of the streets, but prescribe, often at great length, all the details of the management of the road, specify the number of trips to be run, the rates to be charged for fares, the hours of labor, the dimensions of the cars, and even the kind of uniforms to be worn by the employees. These contracts are always drawn for a fixed term; and one point which is given especial attention concerns the condition of affairs at the expiration of the contract—a subject upon which



almost all of the limited franchises granted in the United States are absolutely silent. These European concessions specify the amount to be set aside for the amortization and redemption of capital, specify what shall be done in the way of repairs and maintenance, declare what extensions, usually naming the streets, shall be built from year to year, and provide at the expiration of the concession either for the free transfer to the municipality of all the property of the company, or else provide specifically the conditions and the valuation at which the municipality may buy the plant. As a rule, provision is made for the amortization or repayment of the larger part of the share capital, so that at the termination of the concession the stockholders may receive from the sinking fund thus established and from the payments made by the city for the road, the full amount originally invested.

Competition between the firms supplying electric machinery has become, especially in Germany, very sharp, and in their eagerness to obtain contracts for equipments these companies engage in very bitter competition among themselves. Conditions are imposed by the municipalities which are extremely burdensome, and which in many cases will restrict the earning power of the road to such a degree as will make it almost impossible for any considerable amount of profit to be realized by operating the railways; but, in order to take the contract for the equipment of the road away from some business rival, these conditions are accepted, because the contractors do not intend to hold the stock of the company, but to place it on the market as soon as possible.

This competition does not affect the earnings of the manufacturing companies, as the reduction in the price of machinery brought about by competition does in this country, but affects the stockholder who may acquire his stock after the road is built.

The manner of starting a street railway company in a German city follows:

For the formation of a company it is only necessary for a group of persons to associate themselves, and after the adoption of by-laws register the company and its by-laws with a government officer. Such a company or an individual must then obtain permission to use the streets, and on this point the law varies somewhat in different parts of the empire. In Prussia it is governed by the general Prussian statute; in Saxony, by the Saxon code; in Baden, in the Pfalz, in the Rhine Provinces and Rhenish Masses by the French code (Code Napoleon); and in the remainder of Germany by the common law, which is based on Roman law; but, in general, permission to use the streets must be obtained from the local authorities, who by law are the owners of the streets.

It is contrary to both the Imperial code and the codes of the different states to allow the formation of companies by special charters. The police authorities must first approve the permission to use the streets, and this permission suffices if the cars are to be drawn by horses; but in the event of the use of mechanical power of any kind, the state railroad authorities must act with the police authorities. After this approval has been obtained, the consent of the authorities in control of the streets must be had.

All details in relation to the operation of the road, so far as they concern public safety and health, are in the hands of the police, who also, under the terms of the concessions, have the power to see that the contract requirements are lived up to by the road.

The present development of the street railway system in Germany has led the principal cities which now have street railways to desire the conversion of horse traction into electric traction, and many smaller places which have never possessed a street railway have decided that they would like to have one within their boundaries. Under these conditions they let it be known that such a change is desired, and negotiations are begun with some manufacturing firm to build and equip an electric road. After a great many provisional contracts have been submitted, an agreement is finally reached, embodying the conditions agreed upon. The manufacturing company then enters into an agreement with some great banking house, which undertakes to finance the enterprise. A stock company is formed, the stock sold to investors, and the bank and the manufacturers are so and out of any interest in the company, and both have made their profit—one from the machinery it furnishes, the other from its commissions for placing the stock.

In France the construction of street railways is governed by the law of June 11, 1880, which allows the building of railways with the consent of the local authorities in the towns; or, in the case of the national and departmental roads, with that of the state or department.

France has a very elaborate system of public ways, maintained partly by the towns, partly by the departments and partly by the general government. The main thoroughfares of travel between the large places are known as national roads, and are built and maintained by the general government; the roads connecting the principal places in a department are known as departmental roads, and are maintained by the departments. Between the smaller places, and acting as feeders to the national and departmental roads, there exists a system known as vicinal roads, and these are supported by the communes, with aid from the general government.

The law has annexed to it a type of contract, and all contracts must, so far as practicable, conform to this type, and the operation of the railway must be governed by the terms of this contract.

By later decrees of the Council of State very elaborate conditions are laid down as to the methods of construction and operation of railways, and powers are given to the police for their regulation.

In the concessions a provision is always inserted allowing the government to purchase the rights of the concessionaire at any time, and the conditions are laid down under which this purchase may be completed.

All contracts must be completed by the Minister of Public Works.

In Belgium, street railways are governed by the law of July 9, 1875, which in its essential features is the same as the French law of 1880, and contains the same provisions relating to the different classes of roads.

In Holland, the general law of 1887 permits the making of concessions by the local authorities, and requires their approval by the provincial authorities.

In Italy, the law of Dec. 27, 1896, relative to the introduction of mechanical traction on street railways, provides for the making of contracts for a period not longer than sixty years, and in general follows the same lines as that of France.

In England, street railways are established under the terms of the tramways act of 1870, the principal provisions of which are:

A provisional order may be obtained from the Board of Trade,\* either by a local authority or by a company, and this provisional order may cover more than one district. If the consent of the districts within which two-thirds of the length of the line is located has been given, the Board of Trade may make an order covering all the districts, although some may have refused their consent.

Provisions are made for the position of the road in the street and for the rate of tolls to be charged. This provisional order must be confirmed by an act of Parliament within two years. The Board of Trade is given authority to revoke, amend, extend or vary the provisional order, and this action must have the same confirmation by Parliament.

The work must be begun within one year and completed within two years, or the powers given will lapse, but the Board of Trade may extend the time. In the event of a lapse, whatever road has been built is to be regarded as a tramway. A tramway built by a local authority may be leased for operation, or it may be left open for the use of the public and tolls may be collected for this use, but no local authority can be authorized by anything except a special act of Parliament to operate a tramway. A lease made by a local authority which has built a road shall not be made for a longer term than twenty-one years, and non-use of the tracks for three months breaks any lease made under this authority.

\*The Board of Trade in England exercises general supervision over all the public service corporations, and consists of a president, who is generally a member of the cabinet, a parliamentary secretary and a permanent secretary, besides five assistant secretaries, each of whom has charge of some especial department. The Board has a very wide jurisdiction over commercial, marine and transportation matters.

Clauses are to be inserted in the provisional order in relation to the gage of the track, the manner of construction, the authority to open the highway, the repair and maintenance of the space between the tracks and 18 in. on each side; and this work, if not properly done, may be done by the highway authorities and charged to the company. Provisions are made for the protection of underground work in the streets, and authority is given to the owners of this underground work to interfere with the operation of the tramway for the purpose of repairs. Notice must, however, be given to the tramway company of such intended repairs, and any extra expense due to the location of the tramway in the streets must be paid by the tramway company.

Carriages with flanged wheels may be used, and those of the company or the lessee shall be the only carriages with flanged wheels which may use the tracks, unless specially provided for. These carriages must not extend more than 11 in. beyond the wheels.

After the tramway has been open for three years, 20 rate payers or the local authorities may petition the Board of Trade, stating that the public are deprived of the full benefit of the road, and, after a hearing, the Board of Trade may grant licenses to others to use the tracks with carriages approved by the Board under these conditions:

(1) The license shall be for not less than one nor more than three years, renewable by the Board. (2) The license shall be to use the whole or part of the tramway. (3) The license shall direct the number of carriages to be run, the mode and times. (4) The license shall specify the tolls to be paid for the use of the tramway. (5) The license shall allow one person to be authorized by the promoters to ride free on each car. (6) The Board of Trade may at any time revoke, alter or modify a license, for good cause shown.

If a tramway be disused for three months, the tracks may be ordered removed at the cost of the company.

If a company becomes insolvent, the Board of Trade may order the removal of the tracks, unless the same are bought by the local authorities.

Provision is made for a compulsory sale to the local authorities at the expiration of a period of 21 years from the time of opening the road; and if no advantage is taken of the option at that time, no further action can be taken for seven years. The action of the local authorities must be by a majority vote in a meeting at which two-thirds of the total number of members are present, and one month's notice must have been given of the intention to purchase the road.

With the consent of the Board of Trade, a sale of the road may be made by agreement at any time after six months from the opening of the road for operation.

Under these clauses several municipalities have acquired the ownership of the roads within their limits by purchase, while others have built roads under the authority given in the first part of the act.

The local authorities may make by-laws to regulate the rate of speed, the distance apart of the cars, the stopping of the cars, and the traffic on the road where the tramway is laid; and the company may make regulations, by by-laws, in relation to nuisances, and these by-laws may impose penalties, but must have the approval of the Board of Trade.

Penalties are laid down in the general law for obstruction to the laying out of the tramway, for obstruction to the operation of the road and for evasion of fare.

Power is reserved to the local authorities to widen and alter roads in which tramways are laid, and the public is given full right to use the tracks with carriages without flanged wheels.

The local police are authorized to regulate the traffic.

The section of the act which provides that at the expiration of 21 years from the date of a road's beginning operation the local authorities may compel the sale to themselves of the plant of the company, contains these words: "upon terms of paying the then value (exclusive of any allowance for past or future profits of the undertaking, or any compensation for compulsory sale, or other consideration whatsoever) of the tramway, and all lands, buildings, works, materials and plant of the promoters suitable to and used by them for the purposes of their undertaking within such district, such value to be in case of difference determined by an

engineer or other fit person nominated by the Board of Trade on the application of either party."

The interpretation of this purchase clause has been submitted to judicial determination by the highest court under the following circumstances: The London County Council gave notice to the London Street Tramways Company of an intention to acquire its road, and an arbitrator was appointed, who, in his findings, determined that this clause meant the replaceable value of the tracks and property of the company, less a proper charge for depreciation. The company maintained that its property should be treated as that of a going concern, and should be valued at what it was worth for the purposes of rental, and appealed the case.

The decision of the arbitrator was revised and remanded by the Divisional Court of the Queen's Bench, but the Queen's Bench Appeal Court, on the appeal of the County Council, sustained the arbitrator. (Law Reports (1894), 2 Q. B., 189.)

About the same time the city of Edinburgh desired to take over the tramways in that city, and these two cases were taken to the House of Lords for the determination of the meaning of the words used in this section. (Edinburgh:—Law Reports (1894), A. C., 456; London:—Law Reports (1894), A. C., 489.)

The decision of the House of Lords, one justice dissenting, is given mainly on the grounds that the words "exclusive of any allowance for past or future profits" preclude the consideration of the question of rental value, since rental value can only be determined from the amount of the profits, and, as profits from their very nature must be the result of past operations, there cannot therefore be any such thing as present profits. The court, however, considers that the intention of the act is plainly to consider the value of the tracks in their place in the street and as adapted for the purposes of the road—not merely as old material.

Since this decision was rendered another case has been passed upon by the lower courts, and on this appeal to the House of Lords is now pending.

Municipal ownership of tracks may, as provided in the tramways act of 1870, exist without municipal operation; and such is the present condition in many English cities. In London the County Council, after acquiring the tracks and fixed property of the London Street Tramways Company and the North Metropolitan Company, has leased both to the latter company.

A portion of the line of the London Street Tramways Company was acquired by the County Council in 1895, and was leased back to that company at a fixed rental. A proposition was afterwards made by the North Metropolitan Company to sell its tracks within the county to the County Council, and to take a lease of the whole, both of its original tracks and those of the London Company, for 21 years, for a fixed rental of £45,000 a year, and 5 per cent of the increase in gross receipts from the existing lines of the two companies, both within and outside the county, over the gross receipts for the year 1895. This proposal was not accepted, but eventually a lease was made for 14 years, at £45,000 fixed rent, and 12½ per cent of the increase in gross receipts.

Any extensions were to be built by the County Council, and the company was to operate these and pay 6½ per cent on the outlay of fresh capital.

An agreement was also made that the County Council should purchase the buildings, and lease them to the company, the Council to receive as rent 5 per cent on the cost to it of those on freehold land and 6 per cent of those on leasehold land, the Council paying the ground rent.

If a new system of traction should be introduced, the company is required to make, at its own expense, a trial on one mile to be selected by the Council, and if the experiment prove successful the initial cost will be repaid to the company. When such a system has been fully adopted, the County Council is to receive the fixed rent, £45,000, 6½ per cent on the outlay of fresh capital made by it, and four-fifths of any additional profits earned after the shareholders shall have received 5 per cent on their then capital.

Liverpool has just taken possession of its road, the tracks of which were owned by the city; and Manchester is now before Parliament asking authority to operate its cars, the tracks there, as in Liverpool, having been the property of the city. Glasgow,



Sheffield, Nottingham, Leeds and Huddersfield are some of the larger places which operate their street railways, but power to do this has been especially conferred on them by act of Parliament. Birmingham and Bradford are two of the larger towns where the tracks are owned by the city, but are operated by a company.

## THE HOUSTON STRIKE.

On March 15th all employes of the Houston Electric Railway went out and the road was practically tied up until April 1st, when the trouble was settled. The strike is one more evidence of the mischief which the professional agitator works to employes and company alike; and also that an agreement with the Amalgamated Association is expected to be kept in good faith by the street railway but can be violated at will by the union.

On July 5, 1897, a strike arose over the discharge of three men, the outcome of which was the reinstatement of the men (as to the merits of which we are not informed); and an agreement to recognize the union and give preference to union men in hiring; to submit to arbitration any disagreement; and that the contract and wage scale should remain in force for one year.

The present demand was for a reduction of 25 per cent in the working hours with an increase of 33 1-3 per cent in pay per hour and that the manager cause all the employes of the road not already in the union to become such or suffer discharge; and a few other unimportant items. H. F. McGregor, vice-president and general manager, replied that the existing contract had been kept in good faith by the company, that no complaint was made of its violation by the company and that the contract still had four months to run. That to meet its interest and operating charges alone requires an income of \$21.80 per car per day, whereas the earnings in 1897, were only \$18.17 per car per day, which had made a deficit last year of \$35,000. That the earnings of 1897 were \$30,000 less than three years ago, and special paving assessments and judgments aggregating \$75,000 were still unpaid, and \$50,000 more was required for absolutely necessary renewals, and \$50,000 for extensions demanded by the citizens.

Four days later the men went out and on failure to return within time set by the company, their places were declared vacant and new men hired. On March 19th an attempt was made to start the cars with some new men; hostile demonstrations ensued. Rails were soaped, hose pipe and other obstructions laid across the track and the new men violently attacked. H. C. Chase, secretary of the company, took one car and as it left the power house he was struck on the head with a brick and the carriage in which he was carried to the hospital was stoned. He was laid up two weeks but has now recovered.

With great difficulty and under police protection, cots, bedding and food were taken to the new men who camped in the power house. During the following week ineffectual attempts were made to resume service, Superintendent Eels and ex-Superintendent Mundes acting as motormen. On March 27 a resolute effort was made to open the road and cars containing women passengers were stoned. The mayor called for the militia which was obliged to charge the mob with fixed bayonets before it could be dispersed. In the afternoon the Houston Cavalry was ordered out in order to return the cars to the barn. By the 29th 62 men had been

employed, including some of the strikers who returned to work, and a fair service was maintained.

On March 30 the strike was settled upon the following conditions which had been offered several days before by General Manager McGregor.

"That company take back as many former employes as possible. The 49 new men shall be placed on regular run list commencing at foot and going upward until all are placed, then all vacant positions above them shall be assigned to the old men in order of rank. Balance of old men shall be placed on extra list as eligibles and advanced in regular order under the rules.

"That three additional cars will be run during this summer that will give regular runs to nine men; but it is understood that engineers, shop men and track men are to be returned to their old positions.

"That scale of wages be scheduled at 13 cents per hour for the first six months; 15½ cents per hour for one year thereafter; 16 cents per hour thereafter up to three years; from three to five years 16½ cents per hour. After five years' actual service 17 cents per hour with shorter schedules where practicable.

"The rate is offered with notice to the public that the company shall ask equitable relief from the next legislature to meet the conditions under which we operate and the changed conditions relative to paying assessments generally, under the recent decisions of the courts. That all employes who desire to work nine hours where conditions permit may do so at established rates per hour.

"That the company recognizes the individual rights of applicants to be free from coercion. Company will not exercise paternal direction over their personal affairs nor discriminate against union men in soliciting employes. That all regular employes receive free transportation over lines of the company.

"That company will not discharge men for belonging to a union and on allegation of so doing the question will be submitted to arbitration, the committee to be chosen, one man by the company and one man by employes and one chosen by these other two.

"That company will maintain schedule of wages for one year at least, and observe propositions as recited."

Prior to the strike the rate of wages at Houston was 15 cents per hour after six months service. Following is table of wages and working hours in other prominent southern cities.

City—	Population.	Rate per hour.	Hours.
Baltimore . . . . .	434,439	15	....
New Orleans . . . . .	242,039	14	12
Washington . . . . .	230,392	16¾	11
Louisville . . . . .	161,129	12½-16½	....
Nashville . . . . .	76,168	12	12
Atlanta . . . . .	66,533	12	12
Memphis . . . . .	64,495	14	12
Charleston . . . . .	54,955	*12	12
		**12½	
Mobile . . . . .	31,076	12½	12
Birmingham . . . . .	26,178	**13	10-15
		*15	10-15

\*Conductors. \*\*Motormen.

## STREET CARS NOT FOR CRIMINALS.

It has been the custom of the city, county and government officials in Scranton, Pa., to take their prisoners to the jail or courts in the street cars. The United States marshal and his deputies commenced to transport whole carloads of prisoners whenever occasion demanded. The patrons of the street cars strenuously objected to rubbing up against vagabonds, robbers and counterfeiters. In consequence General Manager Silliman has issued an order that under no circumstances should a conductor receive a prisoner as a passenger.

## CARS FOR MONTE CARLO.

The accompanying illustrations show exterior and interior views of a number of cars recently built by the J. G. Brill Company for Monte Carlo. They are in many respects unique and quite out of the ordinary American practice. The cars are 19 ft. 2 in. long over the end panels and



CAR FOR MONTE CARLO.

with the platforms 4 ft. 2 in. long, making them 27 ft. 6 in. over the dashers. The body is 6 ft. 1 $\frac{3}{4}$  in. wide at the sills and 6 ft. 8 $\frac{3}{4}$  in. wide over the posts. The specifications state that the car cannot exceed 6 ft. 10 $\frac{1}{4}$  in. at the widest point. This consequently makes a side with but little curvature. There are four enormous windows to a side, a feature specified by the railroad company in ordering. Short as the body is it is divided into two compartments, one for first and the other for second class passengers. Stationary cross seats accommodate 12 persons in each compartment. As will be seen from the interior view the seats on one side of the aisle are designed for two persons, while those on the other side are single. The two center seats in each com-



VIEW OF INTERIOR.

partment are arranged back to back. In the first class compartment the seats are upholstered and covered with olive plush. In the second class compartment the seats are of cherry slats with high backs. This portion of the car is very plain, but the first class compartment is highly ornamented and finely finished.

The car is mounted on No. 21E trucks. The side frames are made of solid forgings; the outer ends of the frame carry half-elliptic springs. At the axle boxes there are double journal springs as well as a pair of spirals resting on the

frame. The combined action of these springs gives a very easy riding car body as well as great steadiness of motion. The truck is 1 metre gage and 6 ft. 6 in. wheel base. It is fitted with G. E. 53 electric motors. The wheels are 33 in. in diameter, Brill pattern centers with steel tires. The car is fitted with electric brakes in addition to the ordinary hand brakes. There are two sand boxes, two gongs and two electric headlights. The windows have a cherry sash and spring roller curtains. The platforms have Brill folding gates fitted to each opening. The total height from the head of the rail is 10 ft. 9 $\frac{1}{2}$  in. The exterior of the car is finished in a dark olive green. The coat of arms of the principality appears upon the center of the window panel. Taken altogether they have a very striking appearance, and the style of finish is so superior to that of any ordinary European cars that they will attract a great deal of attention on the other side.

## ELECTRICAL EXHIBITION NOTES.

The interest taken in the Electrical and Kindred Industries Exhibition to be held at Madison Square Garden next month is by no means limited to Greater New York, and extends in every direction. Numerous comments have been made by the foreign press, and by journals in different parts of this country. One of the most striking evidences of this interest is to be found in the remarkably large accessions to its membership which the New York Electrical Society has enjoyed since the exhibition was announced under its auspices. In February the secretary announced a list of a round score of new members, and he now states that the applications for March should reach close upon 50.

A special committee of the auxiliary and educational committee has just drawn up on behalf of the Exhibition a plan whereby prizes to the value of not less than \$100 are offered to the pupils in the public and private schools in New York and its vicinity for essays on the electrical exhibition. The essays will be limited to 1,500 words, and will be accepted up to May 18th, the awards being declared and prizes presented not later than May 28th. No contestant is to be over 16 years of age.

Fred Catlin, the manager of the telegraphic tournament, has completed the preliminary arrangements for that contest, and has arranged the classes. Circulars on this subject are ready for general distribution, and there is already a great demand for information on the subjects from all parts of the country. Mr. Catlin informs the management that the entries will probably be more numerous than at any other tournament that has occurred, and thinks that some of the records will be phenomenal.

H. V. Parsell, the well-known banker of New York, who has long been interested in electric disposition work, has kindly placed in the hands of his son, H. V. Parsell, Jr., the electrical engineer, for exhibition, his marvelous collection of galvanoplastic work, done during a long series of years. It may be doubted whether any other amateur could possibly show anything approaching this remarkable collection in beauty and interest.

As showing the incinerating effects of high frequency currents the remains of the eagles illustrated in the March REVIEW will be displayed.

Chief McCullagh, the head of the police force of Greater New York, has evolved a system of communication, which



marks a new departure in the police supervision of any large community, and has promised to show it in operation.

The magnetic separation of iron ore, which Mr. Edison has been perfecting for some years past, will be shown by means of a model built for him by Sigmund Bergmann.

Colonel N. H. Heft, the electrical engineer of the N. Y., N. H. & H. Railroad Company, whose work is so widely known in connection with the successful third-rail line between Hartford and New Britain, Conn., has placed at the disposal of the management blue prints showing the construction of the track and some of the actual material used. The model track from 50 to 100 ft. long, single and double and about 5 in. gage, is now being constructed on Col. Heft's plans, and will be shown in operation during the continuance of the show, the details of the track being imitated as closely as the conditions will allow. Over this track a train of cars will run to and fro continually showing how the current is picked up and delivered to the motor, and how the switches and signals are included in the operation.

## FENDERS IN NEW YORK.

The experience of those street railways which have used fenders on their cars appears to be that those of the basket type projecting in front of the car are the only satisfactory ones. The only objection which has been urged against this type of fenders is that they in effect lengthen the car and strike many persons who would not be touched were there no projecting fender. The accident statistics of the Metropolitan Street Railway, of New York, show that this objection is not well-founded, and that the cars can be operated in the most crowded streets without any increase in the number of accidents because of the use of projecting fenders. This company has placed another order with the Consolidated Fender Company for 350 Providence fenders, that fender having been adopted after giving the subject the most careful consideration.

## WIDE THROWING TROLLEY SPRINKLING CARS.

In most of the larger cities the street railway companies either from choice or agreement with the municipal officials, sprinkle the car tracks. In some instances the burden of sprinkling the whole width of the street has been imposed on the company. It has been found in every case that it is cheaper to purchase a tank or sprinkling car for this work rather than have it done by wagons.

The Miller-Knoblock Company, of South Bend, Ind., has designed a sprinkling car which not only waters the car tracks but sprinkles any street or avenue 100 ft. or less in width. The tank has a capacity of 2,500 gals. and is propelled by two 25-h. p. motors. A sprinkler is placed at each of the four corners of the car and they are controlled by two rocking levers. The width of spray can instantly be reduced and at the same time the mechanism permits a varying quantity of water to be discharged, so as to meet any changes in the width of the road or the speed of the car.

The pump consists of two cylinders, the inner one of gun metal; the outer is of highly tempered steel to withstand high pressures. The pump is operated by an independent differential gear electric motor entirely separate from the movement of the car. Two sprinklers of the ordinary kind are placed below the front and rear of the car for watering

the space between the tracks. This sprinkling car is a radical departure from the usual type and can easily perform a service heretofore impossible.

## A NEW ATTRACTION FOR PLEASURE RESORTS.

The street railway managers welcome any new and novel form of amusement to attract pleasure seekers of the busy cities. The latest novelty in this line for summer resorts is the Buffalo foot cycle. As seen in the cut it is a modernized



BUFFALO FOOT CYCLE.

roller skate but it is so constructed as to give a more pleasant sensation. The foot cycle has a malleable iron frame with the most approved skate clamps and the tires are of

pure rubber molded as hard as is consistent with proper resilience. An improved ankle brace can be provided which moves freely backwards and forwards, but keeps the ankle absolutely rigid sideways. In the illustrated catalog of the Buffalo Foot Cycle Company, 985-995 Ellicott square, Buffalo, N. Y., are many suggestions concerning the management of a foot cycle hall and the varied amusements it affords. Any hall or pavilion, over 25x50 ft. with a smooth floor, will be suitable but a larger one is desirable. There is little difficulty in learning and the amusement will undoubtedly attract and appeal to a very large class of patrons.

## HAZARD COMPANY WILL MAKE COPPER WIRE.

John C. Bridgeman, secretary of the Hazard Manufacturing Company, who has been making quite an extended trip through the west, advises us of an important departure on the part of his company, which is no less than an enlargement of its products by the manufacture of bare and insulated copper wire. The new buildings and machinery necessary for this work are being erected and will be completed and the new plant in operation by July 1. The long and well-known record earned by the Hazard company in its manufacture of wire ropes and cables for street railway and mining purposes is so well established that it is hardly necessary to predict the same reliable wire in copper. The company will draw its own wire, and with the experience in making steel wire, and the new facilities, will be an active factor in the copper wire field.

## MILWAUKEE-WAUKESHA LINE.

Henry C. Payne's new road to Waukesha is well under way, the grading is practically completed, the poles set, and the contracts let for the equipment. The road is 21 miles long to Waukesha, and 4 miles from Waukesha to Pewaukee. It is planned to open the road for traffic July 1. Though not definitely decided upon the cars will probably be equipped with four G. E. 1,000 motors, and a schedule of one hour, including stops, be maintained.

### MERRY-GO-ROUNDS FOR PARKS.

The manager who is seeking for a park attraction will scarcely be able to find anything that will make money easier or more quickly than a well designed "merry-go-round." When properly managed they are veritable gold mines; there is a record of one having earned \$562 in one day, and \$2,850 in a two-weeks' run at a summer resort. The illustration shows a machine which Norman & Evans, of Lockport, N. Y., are under contract to deliver to George P. Kertz, of Pittsburg, by May 10.

This machine has an undulating rotary motion, operating eight cars, designed to represent Venetian gondolas. Each car will carry 12 passengers, thus making the entire seating capacity of the machine, when fully loaded, 96 passengers. The motion combines the pleasant exercise of the well-



SWITCH BACK MERRY-GO-ROUND.

known switch back railway, with the circular motion of a merry-go-round. It is designed to afford pleasing recreation to both young and old. It is strongly and substantially built, insuring perfect safety in its operation. The decorations of the machine are highly artistic, while fine music is discoursed by a military-band organ adjusted to play continually, whether the machine is in motion or at rest.

The whole machine can be packed for transportation on a single flat car, and can be erected at its destination quickly and easily within a few hours.

Although the earning capacity is double that of the ordinary merry-go-round, the price is but little in excess of the smaller machines.

### CONSPIRACY CASE EXPOSED.

On June 15, 1895, Mrs. Jennie Reynolds claimed, in a suit for \$50,000 damages against the Chicago City Railway Company, that she had been severely injured in a collision. She was returning from Manhattan Beach with her husband and friends when two trains collided, throwing the passengers in a heap on the floor. Otherwise the consequences of the collision were not serious. As usual the accident sharks were on hand, and subsequently the company had to defend itself in a damage suit.

A case was worked up and sustained by the most reckless perjury. Mrs. Reynolds swore that in the accident she has received bruises in the abdomen which permanently prevented her from wearing corsets, necessitated several surgical operations, subjected her to fits and divers other

troubles. After the accident she went to St. Paul and lived there with one M. J. Fountain. While there she made application for a divorce and made an affidavit that she had resided in the city for one year. In the damage case she stated that she had only been in St. Paul three days and her accomplice, M. J. Fountain, swore that he had never been in that city. Furthermore, Mrs. Reynolds prevailed upon a Chicago friend, Mrs. Stapleton, to appear as a witness and to falsely swear that Mrs. Reynolds had been living in Chicago last summer.

With great energy M. B. Starring, counsel for the Chicago City Railway Company, and his assistants, collected evidence which convinced them that the case was a fraud. They determined that the reputation of Mrs. Reynolds was very bad, and in several law suits she had been guilty of perjury. They also received a written statement from her husband that these physical troubles antedated the accident.

The documents and witnesses of the defense showed conclusively that many of the sworn statements of Mrs. Reynolds and her co-conspirator Fountain were utterly false. The woman broke down under the testimony arrayed against her and made a confession in open court, admitting in detail that the whole fabric of the testimony upon which her case was based was false. Her attorney, Hiram Blaisdell, then withdrew from the case.

Judge Neely ordered the arrest of M. J. Fountain on the charge of perjury, and recommended that when the grand jury meets to consider his case it shall consider the conduct of Mrs. Reynolds. Mrs. Reynolds was able to secure bonds for her release and on April 3 disappeared. The states attorney will prosecute these cases vigorously. Mr. Starring should be congratulated on his good work in exposing such fraud and saving his company from paying a large sum for damages.

### MAIL SERVICE IN ALABAMA.

The Birmingham (Ala.) Railway & Electric Company, of which J. B. McClary is general manager, is to handle the mails between Birmingham and several towns on the Birmingham and Ensley line formerly served by the "Star route." Hereafter the cities of Ensley, Pratt City and Thomas will receive mail from Birmingham three times a day. The schedule, as arranged, will get the mail to its destination in less than an hour after it is received in Birmingham, which means a big saving of time.

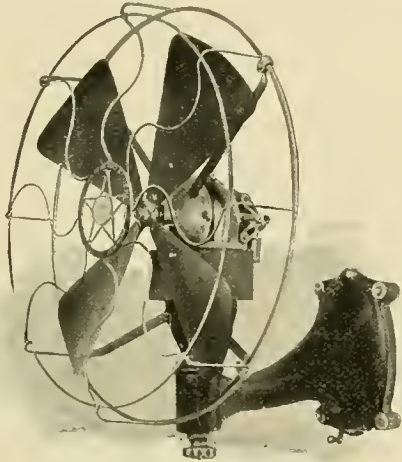
### RECEIVERS FOR DIAMOND TRUCK COMPANY.

The Diamond Truck & Car Gear Company, of Kingston, N. Y., was placed in the hands of Louis B. Hasbrouck, of New York, and John E. Kraft, of Kingston, as receivers on March 25. It is understood that the company is heavily in debt, that it has been operated at a loss from the start, and that no dividends have ever been paid. The receivership resulted from suits by creditors who refused to wait longer. The concern was organized in 1895 with \$50,000 capital, afterwards increased to \$150,000. Liabilities are placed at \$34,000 and nominal assets \$92,000, of which patents are listed at \$51,000 and machinery and patterns at \$11,000. The order was made returnable July 6.



## WESTERN ELECTRIC'S LATEST FANS.

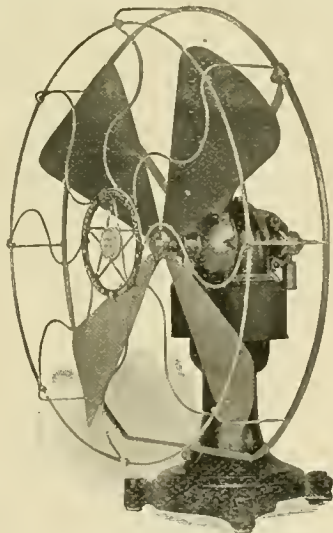
The Western Electric Company has been manufacturing fan motors for the past two years and has placed upon the market 12-in. and 16-in. desk and bracket fans, a ceiling fan and a column fan. The 12-in. fans are wound for 110 volts only; the 16-in. fans and also the ceiling fans are wound for 110, 220 and 550 volts. The desk, bracket and



BRACKET FAN.

ceiling fans are arranged for a switch that allows them to be operated at three different speeds. The ceiling fan has four blades and an attachment for incandescent lamps. The fans can be furnished without this attachment and may also be run with two blades instead of four. The switch is at the base of the motor and of easy access. The column fan is arranged with two blades and has but two speeds.

Exhaustive experiments have been made on these fan motors in order to determine the most economical angle at



DESK FAN.

which the blades should be placed and also the most advantageous size of blades to be used, and it is claimed that these fans give the greatest wind output for the least consumption of electrical energy.

The Western Electric Company has issued a very complete and attractive catalogue of 36 pages, giving in detail description of the working parts of the fan motors together with price lists and complete illustrations of all the motors manufactured by it.

## TEAPOT FARE COLLECTORS UNPOPULAR.

The American riding public uniformly rebels against the system of fare collection commonly known as the "tea pot," and it seems strange with all the excellent portable and stationary fare registers on the market that any manager should consider the use of a system at once cumbersome and undignified, and repugnant to both passengers and conductors. It has always seemed to us the opportunity of working off bad money by people so inclined, was alone sufficient to make the "tea pot" collection too expensive a proposition even if it had any advantages, which it certainly has not. We do not find one redeeming feature in this system of fare collection; collection is the word for the operation is quite similar to the passing of the hat.

The Saginaw (Mich.) "Leader" thus expresses the "grand kick going up among the traveling public" of that city. It says:

"This morning a new system went into vogue on the Union Street Railway Company and by order of the receivers the conductors were all equipped with what might be called 'a nickel-in-the-slot machine.' The machine or box is used for collecting fares and the conductor holds it out like the monkey attachment to a hand-organ holds out his hat for pennies, and the passenger is requested to drop his nickel or check in the box when the conductor will ring him up. It does away with the conductor's report, for when he comes off his run all he has got to do is to turn over the box to the office and his labor is done.

"Under no consideration is he to handle the money of any passenger. The only money which he is to handle is to make change for a passenger and the passenger must then drop his fare in the slot machine. The question is being agitated, will a passenger be obliged to not only pay but work his passage also. It is a hardship that will not be entertained for a moment by the citizens of Saginaw, and in a few days some passenger will refuse to put his nickel or check in the box but will tender it to the conductor and if he refuses to receive it will then return it to his pocket and ask the conductor to put him off the car, and then a law suit will be commenced to test the case."

## INTERURBAN ROADS IN NEW JERSEY.

On March 31, the governor of New Jersey approved the "trolley bill" which provides that the board of chosen freeholders of any county in the state may widen, straighten, change the grade or location, or otherwise improve any public railway in its control and may authorize the construction and operation of a street railway thereon, subject to the consents of the governing bodies of the municipalities through which the proposed road is to pass, and of the owners of a majority of the lineal feet of property along the highway. Franchises are to be limited to 75 years. The company applying for a location must submit a proposition specifying whether the party making the same intends to construct a single or double track street railroad, and if a single track road, the length and location of sidings and switches; the motive power to be used; the rate of fare to be charged; the amount of money to be contributed for defraying the cost of improving the public highway, as proposed by said board, and such other terms as the party making such proposition may be willing to agree to.

## PERSONAL.

John W. Burchinal has been chosen president of the three new electric railway companies incorporated at Cumberland.

F. W. Thompson, superintendent of the Muskegon Street Railway, was a REVIEW caller when in Chicago recently.

George W. Steadman, of Westerly, R. I., has been appointed superintendent of the Pawcatuck Valley Street Railway.

C. E. Lathrop, who has been manager of the Christie Steel Company, has been transferred to Wichita, Kan.

Morgan J. Sweeney has been appointed to superintend the track construction which the Scranton (Pa.) Railway Company has in hand.

J. T. Whittlesey has resigned his position as chief engineer of the Brooklyn Rapid Transit Company's system to go with the John Stephenson Company.

I. B. Walker, chief engineer of the Patton Motor Company, was married on April 6 at Sioux City, to Miss Jessie M. Leach, at the residence of the bride's parents.

Jackson I. Case, president and general manager of the Belle City Street Railway, Racine, Wis., is the new postmaster and took charge of the office on April 1.

Russell B. Harrison, president of the Terre Haute Street Railway, is also quarter-master general on the governor's staff, and has tendered his services in case of war.

J. W. Carson, president of the Sterling Manufacturing Company, New York, and William Tiffany, secretary, spent several days in Chicago, the latter part of March.

W. H. Jordan, chief repairer of the Birmingham (Ala.) Railway & Electric Company, on March 18 received a severe shock while at the top of a repair ladder and fell to the ground, fracturing his skull.

John D. Moore, who for some time has been master mechanic of the Lewiston (Me.) Bleachery & Dye Works, has accepted a position with the Walker Company in the engineering department.

F. W. McAssey, who has been secretary of the Rockford (Ill.) City Street Railway Company, has resigned and gone to Windsor, Mo., to settle the estate of his father. He is succeeded by Charles Lines.

Thos. H. McLean, who recently accepted the office of general manager of the Toledo Traction Company, arrived in that city on March 31 from the City of Mexico, and entered upon his duties the following day.

S. G. Coleman, formerly secretary of the Badger Illuminating Company, has been appointed acting superintendent of the Milwaukee Electric Railway & Light Company to succeed William Church, who has resigned.

J. Paul Baker, secretary of the Baltimore Car Wheel Company, spent several days in Chicago on the occasion of his western trip in March. His company has a large amount of work in hand, and have been working large forces for several months.

C. M. Davis, who has been connected with the Poughkeepsie City & Wappingers Falls Electric Railway Company for 21 years, resigned his position as superintendent to become a selling agent for L. J. Coburn, of the Hudson Valley branch of the New Orange Industrial Association.

H. S. Haselton has been appointed general manager of the Milwaukee & Waukesha Electric Railway, better known as General Winkler's line, the application for franchises having been made through him. Mr. Haselton has for several years been secretary of the Metropolitan Iron & Land Company.

T. Commerford Martin, editor of the "Electrical Engineer," has been appointed by the government as head of the electrical commission to the Paris exposition in 1900. The appointment is a well-deserved tribute to Mr. Martin, who has long occupied a prominent position in the field of electrical engineering.

Oscar C. G. Urban, who until March 26 was superintendent of the Middletown-Goshen Traction Company, Middletown, N. Y., was awakened early the following morning and summoned to the power house, where he found the entire force of the company assembled. He was wanted to receive a diamond stud which the employees presented to him as a token of their good will.

T. H. McLean, vice-president and general manager of the Toledo Traction Company, has made appointments as follows: John F. Collins, superintendent to succeed A. M. Hinckley, resigned; James Yates, superintendent of shops succeeding F. B. Perkins, resigned. The office of purchasing agent, held by O. E. Merrill, is abolished and that work will be assumed by the general manager.

Wm. Ring has been appointed general superintendent of the Baltimore & Northern Electric Railway Company. Mr. Ring has been identified with the electric railway business since its inception, having worked with the Daft and Van Depoele systems from 1886 to 1889. For the next two years he was superintendent of the Lancaster (Pa.) street railways, held a like position from 1891 to 1896 with the Paterson (N. J.) Central Electric Railroad Company, and then was with the Fall River (Mass.) Street Railway Company until the past month.

J. C. Brackenridge has been appointed chief engineer of the Brooklyn Rapid Transit Company's system, vice J. T. Whittlesey, resigned. The track department has been combined with the electrical engineering department, and the chief engineer will be assisted by R. P. Brown, electrical and assistant chief engineer. Mr. Brackenridge has had an extensive experience; he was with the Brooklyn and the Union elevated roads as assistant engineer in charge of foundation construction and track work from 1884 to 1889; with the Phoenix Construction Company, engaged in electrical subway work, in 1889, and with the cities of New York and Brooklyn, as assistant engineer on water works extension, from 1882 to 1892. In 1892-4 he was with the East River Bridge Company. Before his appointment to his present position Mr. Brackenridge was chief engineer of the track department of the Brooklyn Heights and the Brooklyn, Queens County & Suburban roads, and was at the same time engineer of the Associated Trolley Companies of Brooklyn.

## OBITUARY.

We learn with regret of the death of J. K. Waterman, manager of the Cape Electric Tramways, Cape Town. Mr. Waterman was but 37 years of age.

Nelson W. Perry, well known as an electrical journalist, author and engineer, died at his residence in Brooklyn on March 28. Mr. Perry was the evening before experimenting with an incandescent gas burner of his invention, the room being darkened at the time, and reaching for a glass of water took up and drank from a glass containing a solution of bichromate of potassium. The mistake was immediately discovered and remedies applied, but Mr. Perry died the following day.

A test case is to be made of the Nebraska law against officers accepting street railway passes. Capt. Henry P. Haze was arrested at Omaha on April 4 charged with this offence.



## NEW PUBLICATIONS.

The April issue of "Hartshorn's Roller" is just as attractive as the previous ones, and there is no excuse for the trade to remain ignorant of the advantages of Hartshorn's rollers when the information may be acquired from such a source.

The third annual bulletin of the Engineers' Club, of St. Louis, indicates that the society is in a very prosperous condition. With 191 members, well attended meetings and a full treasury, the future of the club is very bright. Richard McCulloch, engineer of the St. Louis, Cass Avenue and Citizens' railway companies, is the secretary.

The American Electrical Directory and Buyers' Manual for the first quarter of '98 is out, and in a very neat and convenient form presents a complete list of the electric light central stations of the country. A classified buyers' list is also given, moonlight schedules, etc.; \$4 per year, quarterly; E. L. Powers, publisher, Monadnock building, Chicago.

The latest publication from the Q & C Company, Chicago, is an illustrated supplement to Catalog C and D, describing the Q & C-Stanwood steel car steps. These steps are made in five different styles, both for open and closed cars, and are now in use on 500 railways. The self-feeding rail drill, compound lever jacks, steel brake shoe keys and portable rail and shop saws are also illustrated and described.

The revised edition of the "Electric Light Supply Catalog for 1898" has been distributed to the patrons of the Western Electric Company, of Chicago and New York. It is a well-bound book of 555 pages, with numerous cuts and complete price lists. The catalog presents a handsome appearance, being in book form and bound in cloth. The general character of the book is such that electrical men will be pleased to place it in their files.

"The Universe" is the cosmopolitan title of a new and attractive weekly published in magazine form, the first number of which bears date of March 8. It is an illustrated newspaper for "young people and busy men and women" and is specially interesting to the street railway fraternity from the reason that its publisher and editor-in-chief is E. J. Wessels, who has so long and successfully managed the Standard Air Brake Company, and who left that position to undertake this new work, which he has long had in contemplation. "The Universe" will discuss current literature, science and art, and the important events of the day. We welcome Mr. Wessels to the army of journalists, and wish for him the largest measure of success.

"A History of the Yerkes System of Street Railways in the City of Chicago" is the title of a recent publication which will be found interesting by street railway men and investors. In the introduction is a brief account of the early street railways in Chicago and their effect in promoting the growth of the city. Then follows the story of the growth of the Yerkes system; the various properties are described in detail, the articles which have appeared in the street railway papers being largely drawn upon, with the result of bringing together in convenient form the data concerning the many companies constituting the system. The book comprises 64 pages and is profusely illustrated with portraits of the men who have financed and built and managed the roads, and with views of the various power houses, etc. There is included, also, a short sketch of Mr. Yerkes' life, and more particularly his business career in Chicago.

A proof sheet of the tickets used by the Detroit, Fort Wayne & Belle Isle Street Railway Company was stolen from the printing office and a plate made from it for printing counterfeit tickets, some of which have been received by the company. Although the printing on the spurious tickets was perfect they were detected by the paper used.

## DATE OF ILLINOIS STATE ASSOCIATION MEETING.

The date for holding the first annual meeting of the Illinois Street Railway Association has been set for June 7, 8 and 9, in Chicago. It was at first intended to hold the meeting a little earlier, but this change has been made to correspond with the date of the National Electric Light Association which convenes here on the dates named. The change will be most acceptable to all, as a large number of members of the Illinois Association will desire to attend some of the sessions of the Light Association, and the further advantage of meeting the larger number in attendance will be gratifying to every one. Secretary Minary is issuing the notices for the convention and it is urged upon every street railway in the state to send at least one delegate. Local committees will plan for suitable entertainment of visitors, and no effort be spared to make the occasion as profitable and pleasant as possible. It is contemplated that all exhibits be made under one roof, and that the business sessions of the two bodies be held in separate rooms.

## MEADVILLE, PA., HAS ELECTRIC CARS.

Meadville, Pa., is an old town, the first settlement having been made 110 years ago, but it has had the blessings of electric traction only for a day. The first car was run over the lines April 7 carrying the officers of the company and a few invited friends. The car was decorated with flags and flowers and met with a hearty reception from the populace, most of whom witnessed the wonders of electricity for the first time. On April 14 the road was accepted from the contractors and opened to the public with due ceremony. A banquet was held in the evening and attended by the mayor of the city, the principal citizens and the friends of the company.

The officers of the Meadville Traction Company are: Frank R. Shyrook, president; Dr. Cyrus See, secretary; Charles Fahr, treasurer; and J. Langstaff Johnson consulting engineer.

## NEW FORM OF RHEOSTAT.

In many particulars carbon is suited for resistance but for rheostats it is difficult to maintain a lasting contact. Between the carbon and the copper, brass or other metal electrolysis results. To obviate this difficulty W. R. Garton, of the Raster Carbon Rheostat Company, has experimented and found an alloy which is free from this effect. The carbon, of special composition, is pressed in strips through a die and these are assembled in frames being alternately insulated by mica and connected by contacts of the special alloy. The rheostat occupies a very small space, the carbon resistance remains constant and will withstand very high temperatures, the contacts remain unaltered and all parts are easily repaired. Rheostats are made for 500-volt circuits and some are so proportioned that a 110 or 220-volt motor for fans and other purposes can be operated on a railway circuit.

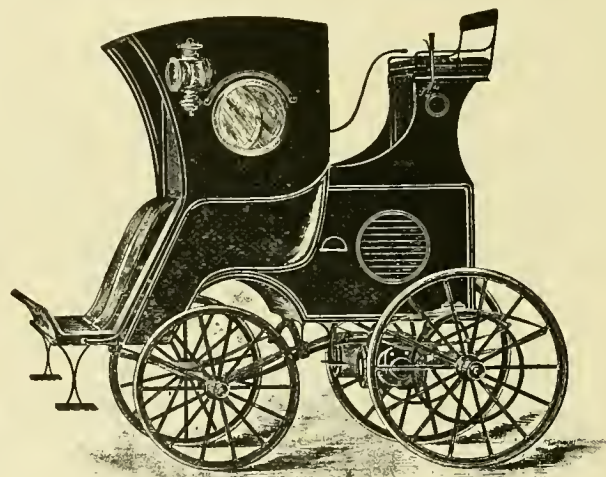
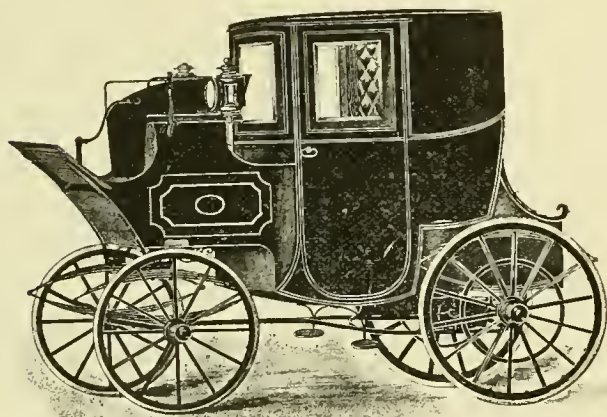
The Union Traction Company, of Anderson, Ind., is now carrying mail between that city and Alexandria.

### MOTOR CABS FOR CHICAGO.

It has been pointed out that the conditions in Chicago are naturally favorable to the operation of mechanically propelled vehicles. There are no hills about the city and the boulevard system, with smooth roadways, extends to every part. One merchant has used motor wagons for some time for delivery purposes, but as yet there are few such vehicles for passenger service.

The Fay Livery Company has taken the initiative and will have motor cabs at the railroad stations and at the principal hotels beside providing some carriages for regular livery service. The first two vehicles will be delivered by May 1 and will appear as shown in the illustration. The one to the left is a handsome cab especially adapted for shopping and sight seeing and the one to the right is a brougham closely resembling the usual style. The panel at the back of the cab can be let down and is braced to accommodate trunks and packages.

These electric cabs have recently been designed by C. E.



MOTOR CABS OF THE FAY LIVERY COMPANY, CHICAGO.

Woods, of Chicago, and it has been his intention to not only proportion and place the mechanism to do most effective work but to make few alterations in the form and size of the cabs customarily employed. The storage batteries in the cab are over the rear axle but well forward so that the weight will be partially borne by the front axle. In the brougham the batteries are divided, part being under the cabman's seat and the others over the rear axle. The Willard battery has been adopted, each cell of which is sealed for cleanliness and to facilitate handling. For the cab two 110-volt motors, each of 1.67 h. p. but capable of running at 100 per cent overload, are geared to the two rear wheels. The controller or battery grouper makes three combinations of cell connections, giving three different voltages and running speeds. The motors may also be reversed. The controller handle, shown beside the seat, also operates a band brake which is around a wheel on each motor armature shaft. The steering head, immediately in front of the cabman's seat, is fitted with ball bearings and little difficulty will be experienced in guiding the cab in any direction.

The cabs are designed to be free from noise, the motors being encased, the wheel tires being of rubber, and the motor pinions of rawhide. The batteries can be charged from

any 110-volt lighting circuit and have a capacity such that a run of 30 miles can be made without recharging. The total weight of the cab will be 2,580 lbs., the vehicle weighing 1,350 lbs, the batteries 1,000 lbs. and the two motors 230 lbs.

### NO NEED OF CONSENT OF ABUTTING OWNERS.

March 29 an opinion was rendered in the Common Pleas Court at Cleveland, O., which is of considerable interest because of the many interurban lines in the vicinity of Cleveland. An injunction had been issued at the suit of one Schaff and others to restrain the Cleveland, Medina & Southern Electric Railway Company from laying tracks and erecting poles along certain roads.

The plaintiffs are all owners of farms along which the proposed electric railway is to extend. In their petition they complained that the company was laying tracks and erecting poles along their farms and injuring their property. Their complaint was based on the contention that

they own the land to the middle of the road, and that therefore no tracks could be built without their consent.

The case was argued before Judge Stone, who dissolved the injunction. Judge Stone held that notwithstanding the fact that farm lands extend to the center of the road, a street railway company, after having received a franchise, has the same rights to lay tracks and erect poles as it has in the city, where the lots extend only to the edge of the sidewalk.

He said that the noise of the cars, the dust which they might stir up, and other items of complaint made by the property owners were nothing more than was contemplated by the establishment of the road. The opinion handed down by Judge Stone is based on a decision rendered by the late Judge Ranney from the Supreme bench of Ohio.

An appeal was taken to the Circuit Court, which, on April 4, rendered a decision sustaining that of Judge Stone.

By a traffic agreement between the Long Island Electric Railway Company and the Brooklyn Elevated Railroad Company, entered into March 31, the trip from Park Row, New York, to all points on Long Island may now be made without change of cars.





**Interesting Bits of Information from all Parts of the Country,  
Boiled Down for Busy Readers.**

A street car mail service was inaugurated at Los Angeles, Cal., on April 1.

The Chester (N. H.) & Derry Electric Railway has been awarded the contract for carrying the mail from between Chester, Derry, West Derry and East Derry.

Lovejoy & Sampson, attorneys, employed in several important suits by the Galveston (Tex.) City Railroad Company, have secured a judgment in the federal court for \$2,500 attorney's fees.

The receiver of the Peoria (Ill.) Water Company has sued in the United States Circuit Court to compel the electric railways to put in appliances which will prevent the "current from being grounded."

The Middletown-Goshen Traction Company, of Middletown, N. Y., has been reorganized and is now under the control of the new directorate. Robert Wetherill, of Chester, Pa., is the new president.

The Fox River Valley Electric Railway Company, of Appleton, Wis., is putting up a telephone line between that city and Menasha. It will parallel the track all the way and will be used for train dispatching.

The Nashville (Tenn.) Street Railway Company has built in its repair shops a handsome car. General Manager Connette has secured additional machinery for the shop which enables the building of cars of the most approved pattern.

The Springfield (Mass.) Street Railway Company is increasing the feeder capacity on its Holyoke line; the company is also substituting 10-bench open cars for its old 7-bench cars, 21 of the latter having been retired this spring.

A street railway mail service has been approved by the assistant postmaster general for Superior, Wis. The boxes will be attached to the right side of the front vestibule on the outside. The deliveries and collections will be at short intervals through the day and an excellent service is assured.

When the city of Duluth, Minn., undertook to list the franchises of corporations for taxation as personal property the Duluth Street Railway resisted and made a test case. A decision was rendered in the District Court, April 1, holding that the county auditor could not place franchises on the personal tax rolls.

The New Jersey Electric Street Railway Company has met with strong opposition in extending its line along 2nd street in Passaic, N. J. The track was laid some months ago

but the property owners prevented the planting of the poles and the stringing of the trolley wire. This work has been finished under police protection.

The Guarantors' Finance Company, of Philadelphia, which has financed a number of street railway operations, has assigned on account of financial troubles growing out of the difficulties of the People's Bank. It is said the finance company was a borrower at the bank of upwards of \$500,000 on securities now found to be of doubtful value.

The street railway at LaSalle and Peru, Ill., has long been in trouble; there are numerous judgments against the company and it is now in the hands of a receiver. In March a strike was inaugurated which was brought to an end by the sheriff attaching the company's property for the personal taxes levied on it by the two towns. The receiver claimed he had no money to pay the taxes.

There was some comment in the papers regarding a shipment of dynamite to Cuba by H. G. Williams, president, and W. S. Selwyn, general manager, of the Portsmouth (Va.) Street Railway Company. The gentlemen explained that it was a transaction with a mining firm in Havana and not with the Spanish government, as reported. In fact, the sympathies of the street railway men are entirely with the Cuban cause.

A suit has been brought against the Northeast Electric Railway Company, of Kansas City, by N. D. Williams, the complaint being that while driving he was compelled to use the railway track by the banks of snow and ice and his wagon was struck by a motor car, throwing him from his seat and inflicting serious injuries. The damages were laid at \$2,499.99, this bargain store sum being stipulated to keep the case from going from the court of appeals to the supreme court.

A year ago last November one of the cars of the Port Huron (Mich.) Electric Railway Company collided with a locomotive on the Grand Trunk Railroad and one of the passengers injured was awarded \$1,136 damages. The street railway company was insured in the Guarantors Liability & Indemnity Company but the latter refused payment of claim owing to alleged willful negligence inasmuch as the car was not brought to a full stop before reaching the crossing, as provided by the statute. Suit was brought and after hearing the evidence the judge took the case from the jury and ordered a verdict for the railway company for the full amount of the claim.

At the Electrical Exhibition in New York there will be a competitive exhibit of designs and models made by amateurs. There are to be six classes, each having prizes offered not to exceed \$50, and bronze medals. These classes include models or machines made by minors, instruments of precision, as galvanometers, etc., the practical application of electricity to communication, the application of electrical appliances to domestic service, working drawing of electrical installation, made by a student of an educational institution, and the design of an instrument, made by an instructor, illustrating some electrical law. Further particulars may be obtained from the management, 15 Cortlandt street.





## ECHOES FROM THE TRADE

Elmer P. Morris, of New York, will have 500 sq. ft. of space at the Electrical Exhibit in May and will show a full line of electric railway material.

J. S. Monroe, 1005 Neave building, Cincinnati, has been appointed agent for the R. D. Nuttall Company in the place of Charles A. Cavagua, resigned.

The Siemens & Halske Electric Company, of Chicago, is now making an inclosed arc lamp which is of ingenious design, compact and the shortest on the market.

The Case Manufacturing Company, of Columbus, O., is doing an excellent export business in cranes and hoisting machinery. A shipment of two cranes has just been made to Sydney, Australia.

Business with J. A. Fay & Egan Company, of Cincinnati, Ohio, has increased to such an extent as to justify it in voluntarily increasing the wages of its employes 10 per cent, the raise going into effect on March 21.

The Peckham Truck Company reports that it now has more work on hand than at any time since it has been in the business. At the factory it is working full forces day and night in order to take care of the orders.

The Sessions Foundry Company, of Bristol, Conn., has recently secured an order for about 260 tons of castings for delivery at St. Paul, Minn., for a counter weight street railway system for operating cars over heavy grades.

The New York Electrical Works have been moved from their location in New York to 515-521 Kent avenue, Brooklyn. The old plant, which had been occupied for the past six years, became inadequate for the increased business.

Sanderson & Porter, 31 Nassau street, New York, have received the contract to build and equip the Meriden, Southington & Compounce Street Railway at Meriden, Conn. They will sub-contract for rails, copper, boilers, engines, generators, cars, etc.

A recent issue of the "American Trade" states that George Hopp, 17 South Castle street, Leith, Eng., solicits correspondence with a view to the purchase of electrical specialties, and Robert Stotesbury, 22 Victoria street, Bristol, Eng., regarding engineer's tools.

The Garton-Daniels Electric Company, of Keokuk, Ia., has published an illustrated pamphlet describing the different types of car, pole and station lightning arresters. Price lists are given and a number of complimentary letters from street railway companies are printed.

The Western Gear Company, Milwaukee, has recently added the New England states to the territory in which it is represented by Wendell & McDuffie, 26 Cortlandt street, New York, and 53 State street, Boston. This places all the eastern business in the hands of Wendell & McDuffie.

The New Orleans Traction Company has placed an order for eight interurban cars with the Barney & Smith Company, of Dayton, O. The electrical equipment, consisting of two 50-h. p. 3SB motors for each car, will be furnished by the Westinghouse Electric & Manufacturing Company.

Within the last month the Metropolitan Street Railway, of Kansas City, has been equipping its cable cars with Pintsch gas light appliances, and will eventually have this light on all except

its electric cars. The Pintsch system is also to be put in all the cars of the Manhattan elevated, New York.

President E. M. Hopkins, of the Rock River Electric Railway Company, is reported to have said that the bonds for the construction of the line are meeting with a ready sale in New York. Money will be raised to complete the line this summer. It is expected that the first contract will soon be awarded.

Four orders for the Wood's flexible pole brackets, aggregating 1,653 in all which were received by the Ohio Brass Company in two weeks of last month, would seem to indicate that the flexible style of bracket suspension, and this particular type of bracket are looked upon with favor as the means of supporting the trolley wire.

The Edison-Brown plastic rail bond was used on the Dublin United Tramways for all the principal bonding. Harold P. Brown, manager of the company, reports that the factory has been running at full capacity since the first of the year. Orders have not only been received from all parts of this country but also from Europe and South America.

The American Electrical Works, of Providence, R. I., always embrace the opportunity offered by holidays and festivals to send to their friends an attractive novelty. On Easter they mailed, in lieu of lillies or the conventional colored eggs, an egg plant, with the suggestion that the seed therein contained be planted and a commemorative egg plant raised.

E. H. Layton, representing Elmer P. Morris, of New York, is now in Europe; his address for the next two months will be 20 Lloyd House, Albert square, Manchester. Mr. Morris is one of the old-established men in the business and makes the foreign trade a specialty, particularly the purchase of complete plants for railway and electric lighting stations.

The Miller-Knoblock Company, of South Bend, Ind., makes and keeps in stock commutators for standard street car motors. They are made and assembled by A. W. Morrell's improved process and are guaranteed material and workmanship. Armature coils for the same motors are kept in stock and the facilities are the best for doing all kinds of electrical repairing promptly.

The Westinghouse Electric & Manufacturing Company has just opened a new branch office at Austin, Tex. J. E. Johnson will have charge of the office and of the further extension of Westinghouse business in the southwest. The large contracts which this company has been handling in Mexico and the Texas region have led to the establishment of this new center of electrical trade.

The Port Jervis Electric Street Railway Company, of Port Jervis, N. Y., has let contracts to the Berlin Iron Bridge Company, of East Berlin, Conn., for building a new power house, car barn and steel bridges. The buildings are to be of a very substantial character, fire proof and covered with the company's anti-condensation corrugated iron. The bridges are of the plate girder type.

W. R. Fleming, formerly of W. R. Fleming & Co., of New York, Boston and Philadelphia, has been chosen vice-president and general manager of the Harrisburg Foundry & Machine Works. The company intends to enlarge its plant to facilitate the manufacture of automatic engines. Several new lines of engines, some of which are specially adapted for electric service, will be placed on the market.

In a neat little leaflet the Partridge Carbon Company, of Sandusky, O., has published a price list of the standard sizes of self-

lubricating motor and generator brushes. The sizes required for the standard motors and dynamos of the General Electric, Westinghouse, Western Electric, Steel Motor, Keystone Electric and other companies are given. Orders for special sizes can be promptly filled.

The Philadelphia Electrical Exposition Company will give an electrical exhibition in its building, 818-820 Chestnut street, Philadelphia, beginning June 6, 1898, and continuing one month. Intending exhibitors may obtain full information by addressing the director, William D. Marks, and diagrams showing location of spaces, together with other information, will be forwarded upon application.

The New York Switch & Crossing Company, of Hoboken, N. J., has secured the services of Louis E. Robert, formerly with the Sterling Supply & Manufacturing Company. Mr. Robert's new position is that of secretary of the company, and he will also act as general outside representative. His long experience in the street railway field, and especially in track work, assures his success in the work.

The E. P. Allis Company, of Milwaukee, has received the contract to build six engines costing \$500,000 for the Metropolitan Street Railway of New York. Each engine will be 6,000 h. p., of the vertical Reynolds-Corliss type, and direct connected to generator. The Allis Company recently was given the contract to build a 1,100-h. p. engine for Ludwig Loewe & Co., Berlin, Germany, in competition with the best builders of Europe.

Smith of New York, whose lights for interior and exterior of cars are found in all parts of the world where street cars and steam cars are known, is enjoying that large trade which comes from the manufacture of a good article sold at a reasonable price. His factory has for some time past been crowded to its fullest capacity, is running night and day, and has orders already entered which will keep it going at the same rate for three months to come.

Frank B. Rae has been retained as consulting engineer by the Calumet Electric Street Railway Company and the Crane Elevator Company. Mr. Rae has also organized a company to manufacture motors, batteries and motor-cycles, the patents for which he controls. The company has a capital stock of \$40,000 and the following officers: H. L. Burnham, president; F. B. Rae, vice-president; Paul Synnestvedt, secretary, and C. W. Dickerson, treasurer.

James F. Heyward, who has been so successful as manager of the City & Suburban Railway Company, of Baltimore, established an office in New York the first of this month. He will be located in the Washington Building, No. 1 Broadway, and will act as a consulting expert for railway companies and investors. Mr. Heyward will not handle any investments but rather will confine his attention to the investigation of railway properties with a view to improving the same and to give expert opinions on the possibilities of future development.

The Dallas (Texas) Street Railway & Light Company has received two cross compound condensing 200-h. p. St. Louis Corliss engines made by the St. Louis Iron & Machine Works. The engines are to be direct connected to Westinghouse generators. The St. Louis works have under construction a 1,000-h. p. Corliss engine for the Consolidated Electric Light & Power Company, of Kansas City, also a number of other large engines for lighting, compressor and pumping purposes.

In the new "Catalog C" the automatic shades and curtains for closed cars made by the E. T. Burrows Company, of Portland, Me., are illustrated and described, and "Catalog E" is devoted to curtains designed for summer cars. The workings of the "Climax" swivel tip wire cable curtain fixture and the "Royal" roller tip curtain fixture are explained. The tin spring shade roller and the types of brackets for holding the same are fully illustrated.

The different fabrics used for the curtains, with the varied styles of trimmings and finishings, are also described.

Wendell & McDuffie, of New York and Boston, have recently issued a new catalog which has been carefully prepared with a view to making it particularly useful and convenient for customers. It consists of sheets 6 $\frac{1}{2}$ x9 in. interleaved with cross-ruled blank paper to serve for memoranda, and held together with paper-fasteners so that a single sheet may readily be withdrawn and replaced without injuring the book. Each page is designated a "circular"; circulars A to L constitute a complete index and elaborate codes for ordering by telegraph; circulars 1 to 91 are illustrated price lists of the different kinds of goods handled by the firm.

It is the slipping heel that wears the hole in the stocking, and it is the slipping belt that wears the leather. Belts that slip not only do not drive properly, but they wear out rapidly. A belt that is too tight is overstrained, and will also wear out rapidly. A thoroughly reliable belt dressing is therefore a necessity in every well regulated factory, and probably no dressing has such a world-wide reputation as Dixon's belt dressing and leather preservative, manufactured by the Joseph Dixon Crucible Company, Jersey City, N. J., which has been on the market for over 20 years.

The heavy business so far this year, showing in fact an increase of something like 40 per cent over the business for the corresponding period in 1897, has made it imperative for the Sargent Company, of Chicago, to considerably increase its capacity, and to that end it has recently installed a large 20-ton electric traveling crane from Manning, Maxwell & Moore, in addition to the cranes now operated, and an additional saw of the latest and most improved type, manufactured by the Q & C Company, and rearranging the receiving and shipping departments extensively. In the power house, new engines, dynamos, etc., are about to be installed. The company now has a capacity of about 1,000 tons a month, which will, of course, be greatly increased by the changes now in process.

The Ball Engine Company, of Erie, Pa., is sending to the trade a very artistic little folder entitled "A Modern Engine" which calls attention to the excellencies of the new automatic governor and the automatic system of lubrication for the single cylinder engine.

"The rapid growth of our business is the strongest evidence of the superiority of our mica" appears as a preface to the 1898 catalogue of "Mica" specialties which has been mailed to the electrical trade throughout the United States by Eugene Munsell & Co., of New York and Chicago.

Charles A. Boyd, superintendent of the Walker Company of Cleveland, has resigned his position, to take effect April 12th. He will enter business for himself, doing general engineering, with offices in the American Trust building, Cleveland, O. Mr. Boyd has been with the Walker Company for the past four years, starting as engineer in the railway motor department, having charge of the design and construction. About one year later he was placed in charge of the entire engineering department, and was promoted to the position of assistant superintendent on January 1, 1897. The following March he was appointed superintendent of the Cleveland Works, having in charge both the engineering department and shops.

The American District Steam Company, of Lockport, N. Y., has contracted to construct about two miles of steam heating mains in Erie, Pa., work to be commenced at once. This will be an exhaust heating plant, and will receive the exhaust from the Merchants' & Manufacturers' Light, Heat & Power Company's station, and from the station of the Erie Electric Motor Company. This will give a continuous supply of steam night and day. The two stations have an engine capacity of more than 2,000 h. p., the exhaust from which will heat a large portion of the city, including the public buildings and many residences. In eastern Pennsylvania the same company has also contracted with the



Edison Electric Light Company, of New York, to construct between one and two miles of mains for exhaust steam heating. This company has engine capacity of about 800 h. p.

The Mica Insulator Company, whose offices are at New York and Chicago, with a branch at London, England, recently received from one of the large builders of electrical machinery orders for over 5,000 "Micanite" segments of a large pattern (many of them more than 17 in. in length), and from another leading manufacturer of electrical apparatus an order for 2,000 segments; also from one of the leading motor builders an order for 26,000 segments. This volume of business would indicate that the company's "Micanite" segments are meeting with favor among machinery builders. The company claims that its segments are softer and wear down more evenly than mica segments. Therefore, they give better satisfaction. A sample set of segments for any one of the smaller machines will be furnished free of expense to electrical manufacturers or repair concerns which are desirous of demonstrating the value of the segments.

The Aultman & Taylor Machinery Company, Mansfield, O., manufacturers of the well-known types of Cahall vertical water tube boilers and Cahall-Babcock & Wilcox water tube boilers, has recently secured valuable additions to the erecting force in the persons of W. E. Bickford and J. C. Cooke. Mr. Cooke has been located in the Philadelphia district for the past six years as superintendent of erection for the Babcock & Wilcox Company, of New York City. The Cahall people are to be congratulated on having secured the services of Mr. Cooke, and as he has made the change for his own betterment, no doubt his many friends will be much pleased to learn of his having taken charge of the erecting department for the Cahall people in Philadelphia and New York. Mr. Bickford has been superintendent of erection for the National Water Tube Boiler Company for the past five years, and recently resigned that position to accept a position as erecting superintendent with the Cahall people with headquarters at Mansfield, O.

The developments growing out of electric traction are interesting and constantly increasing in number. One of these is the necessity for competent engineering in the laying out of pleasure resorts, and where there is a demand, so also there always is a supply found to meet it. Frank M. Blaisdell, landscape artist and engineer, of Boston, some time ago realized the field for high class work in this direction, and has made a special study of the requirements of street railway pleasure resorts. To take a tract of unimproved ground, and convert it into an attractive and successful pleasure resort affords opportunities far beyond that of simply clearing out the brush and making a vacant place where people can congregate. And to do this in such a way that future additions and improvements may follow without needless expense, and that when completed the work shall result as a harmonious whole, is the work in which Mr. Blaisdell has already made a reputation. Among the roads for which he has laid out parks are Portland, Me., New Castle, Pa., Newton, Mass., and Fitchburg, Mass.

The Walker Company, of Cleveland, has recently occupied a very handsome suite of offices on the 16th floor of the Commercial Cable building, 18-20 Broad street, New York. Both the foreign and domestic business has been very satisfactory. Orders have lately been received from the Norton & Attleboro Railroad Company, of Attleboro, Mass., for four double No. 4-A-S and two double No. 5-S equipments, beside a 250-k. w. direct connected generator; for two 150-k. w. three phase synchronous motors for the LaCaine Rapids Power Company; for a 700-k. w. single phase alternator from the Buffalo & Niagara Falls Electric Light & Power Company, and for two 400-k. w. belted generators from the Syracuse Construction Company. Among the foreign orders might be mentioned one for two 25-k. w. direct connected generators for Singapore which came through the office of Bagnall & Hilles, of Yokohama, and for Paris, France, 20 double No. 3-S street car equipments; three single No. 3-S and 18 No. 3-N equipments and four 150-k. w. belted generators. The company has also taken a contract from the government to build three disappearing gun carriages for 8-in. rifles.

The Dorner Truck & Manufacturing Company, of Cleveland, was organized in January, 1898, for the exclusive manufacture of single and pivotal motor trucks. The company occupies about 9,000 sq. ft. of (ground) floor space with its splendidly equipped factory; the large machine shop is fitted with all new and modern machinery specially adapted to the truck business, and the setting-up shop with traveling cranes and special tools; in the yard is a large crane for loading trucks onto cars; there are arc and incandescent lights and electric power; thus having every facility, the company will be able to manufacture trucks at minimum cost. The president, H. A. Dorner, started in the foundry business in 1880, and five years later went into the street railway supply and manufacturing business with W. A. Dutton, under the style of Dorner & Dutton, which concern was merged into a stock company in 1893 under the title of the Dorner & Dutton Manufacturing Company, Mr. Dutton selling his interest in 1895 to Mr. Dorner. The same year Mr. Dorner organized the Dorner Foundry Company, in connection with G. G. Arthur and E. C. Dorner; this plant was closed and part of it sold to the Dorner & Dutton Company in April, 1897, and of which Mr. Dorner was manager until he withdrew and organized the present concern. E. C. Dorner is secretary of the new company.

The Boston office of the Pennsylvania Steel Company has been changed to the Mason building, No. 70 Kilby street, at the corner of Milk street. This change has been made necessary by the expansion of the street railway business. Three of the more important contracts recently secured are: 5,000 tons of rails for the Boston Elevated Railway Company; 1,500 tons for the Fall River & Newport Street Railway Company, and 1,800 tons for the Fall River & Providence Street Railway Company. The iron work for the first three sections of the Boston subway was furnished by this company, and lately the contract for the last section has been closed. A list of the street railway and steam road customers of the company in New England would include nearly every one of the principal systems. The bridge and construction department is equally prosperous. The contract for the Southern Terminal station, now nearing completion, involved 10,000 tons of steel. The contracts recently filled are for the Wellesley College Memorial Chapel, a very large apartment house in Boston, and the baseball cage for Harvard University. The company is now supplying the steel for the new power station of the Boston Electric Light Company, which will be one of the largest and finest in the country.

### OAKETTE CAR CURTAINS.

Since the use of railway curtains has superseded the old-time slat blinds so generally the curtain manufacturers as well as the curtain users have constantly endeavored to procure some serviceable and attractive material of which they may be made.

At first woolen terries were used very generally; this material, while most attractive and elegant, when originally made up, owing to its soft surface, soon became dirty through contact with dust, cinders, grimy hands and moisture. Besides, as a textile fabric it very quickly lost its life and color, burned out by the sun shining through glass in the window.

Such a large demand was shortly created that the attention of experts in the textile line was called to the matter, and very shortly waterproof materials of different kinds were placed upon the market. About five years ago the E. T. Burrowes Company, of Portland Me., placed before the trade its waterproof curtain material, oakette. The sale of this material has gradually increased until, at the present time, it is being used in immense quantities by steam and street railways, also for yachts, steamboats and war vessels. Several of the best war ships of the United States navy are equipped with oakette.

While any waterproof material is doubtless superior to a textile fabric, still oakette should not be confounded with similar appearing materials, which its popularity more than anything else has brought into the field. Oakette is made of a single thickness of heavy materials with the waterproof substance applied directly to it; it permeates the whole texture of the goods. We believe that the imitations of this material are made of two thicknesses of cloth cemented together with a rubber cement; continual roll-

ing over the roller in the hot sun naturally causes these thicknesses to separate in places, giving the curtain a blistered appearance. Oakette cannot be scratched or marred with the finger nail; the surface is hard; it is non-absorbent, water-proof, dust-proof, grease-proof, stain-proof, and may be washed with water and sponge; is not affected by heat or cold; will not fade and is particularly durable.

The E. T. Burrowes Company can furnish this material with any pattern of face. The line that it carries has been gotten out carefully and with particular reference to the needs of the trade; the patterns are mostly symmetrical; the colorings are those which are best adapted for service to which they would be put; no attempt has been made at dainty colorings or fancy patterns, but these, of course, can be supplied if anybody requires them. The oakette curtain is superior to any other curtain, and the price is less than if the same curtain were made of a woolen textile fabric. Oakette is fully guaranteed for a long term of years, and samples will be sent by the manufacturers to anyone interested.

### THE WHEELER HEADLIGHT.

The Wheeler Reflector Company, of Boston, is manufacturing a line of dash lights which are meeting with ready acceptance by managers, and the light we illustrate has proved specially satisfactory, as furnishing the name of the route at a point where the public naturally look first, and so clearly and plainly that it may be seen at a sufficient distance. The sign, which is painted in distinct letters, is instantly changed by a simple turn of a knob at the left of the headlight, and when so set cannot accidentally change to any other. The same company is also putting out a



new stationary dash light with true parabolic reflectors, which requires no cutting of the dash. The various styles of lights are furnished for either oil or electric burners.

A committee representing the bondholders of the Madison (Wis.) City Railway Company has purchased the property from the receiver and effected a reorganization. The new officers elected are: F. W. Oakley, president; G. W. Russell, vice-president; H. R. Newcomb, treasurer, and George Shaw, manager. Many improvements to the system are in progress and contemplated, a new car barn being one of the additions.

When a large sweeper of the Waterloo (N. Y.), Seneca Falls & Cayuga Lake Traction Company was being taken into the car house by Superintendent Gray, the brakes refused to work and the sweeper started down the incline near the barn. It ran down the hill and rounded the curve, colliding with a motor car. The motorman was killed, the superintendent, his assistant and the conductor on the motor car were all badly shaken up, bruised and cut.

### WALKER CLAIMS SWEEPING VICTORY IN TROLLEY PATENT CASE.

As we are closing our forms for this issue the news comes of a decision in the United States Circuit Court of Appeals, in the case of the Thomson-Houston Electric Company, appellee, vs. Union Railway Company et al., appellants, which the Walker Company claims to be complete victory in its litigation with the other two big electric companies. If the expectations of the Walker people in this decision are realized, any one can make, sell and use the underrunning trolley. The dispatch states: "The decision was on a motion for a preliminary injunction, but being on a question of law, it is controlling and conclusive with respect to the validity of the patent, and no appeal lies to any higher court."

#### TEXT OF THE DECISION.

This appeal involves the question whether claims 2 and 4 of Letters Patent No. 495,443 for "traveling contact for electric railways," granted April 11, 1893, to the administrators of Charles A. Van Depoole, assignors to the complainant, are void because they are for the same inventions which had been previously patented in Letters Patent No. 424,695. The invention, to adopt the language of an expert witness for the complainant, in a former suit brought upon the patent, "consists generally in an electric railway having an overhead conductor, and a car for said railway provided with a contact device carried by the car so as to form a unitary structure therewith, and consisting of a trailing arm hinged and pivoted to the car so as to bridge the space between it and the conductor, and move freely both laterally and vertically, and said arm carrying at its outer end a contact device capable of being pressed upward by a suitable tension device into engagement with the under side of conductor." The essential features of construction involve the location of the supply conductor above the track and line of travel of the car and contact with its under side; the arrangement of the contact device on a trailing arm, and the maintenance of a constant upward pressure by means of a tension device operating upon a hinged arm. The two claims in controversy are:

2. "The combination of a car, an overhead conductor above the car, a contact device making underneath contact with the conductor, and an arm carried by the car and carrying the contact device, and pivoted so as to swing freely around a vertical axis."
4. "The combination of a car, an overhead conductor above the car, a contact device making underneath contact with the conductor, and an arm on the car movable on both a vertical and a transverse axis and carrying the contact device."

The patent contains 16 claims. The characteristics of the invention and the scope and validity of many of the claims were considered by this court in Thomson-Houston Electric Company v. Hoosick Railway Company (82 Fed. Rep., 461), where we held that claims 6, 7, 8, 12 and 16 were for the same inventions which had been previously patented; and a reference to the opinion in that case will dispense with the necessity for any extended discussion now. Referring to some of those claims we said: "It would be a waste of time to dwell upon the verbal differences in these claims. The changes in phraseology import nothing of substance into their respective combinations. They describe the same thing in different language." It is insisted for the appellants that the two claims now in controversy are for the same combinations specified in some of the claims which were then held to be void. The appellee contends that they are not because they omit to specify any means for holding the contact device in underneath contact with a conductor, and consequently can be construed as covering a sub-combination in which such means are not employed, or if such means must be read into the claims by implication the claims are not limited to the means described in the specification, and that upon either construction they are not the claims of the earlier patent. The court below adopted this view. If the appellants are right no other question need be considered. It will be seen that these claims are for identical combinations except that the arm is differentiated in each by functional characteristics. The specification describes a traveling arm carried by a post on top of the car "which is hinged and should in most instances be also pivoted to the top of the post, although a reasonable amount of looseness in the hinged joint



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will answer the purpose of the pivot." When pivoted "it swings freely around a vertical axis," and meets the terms of claim 2. When hinged and loosely jointed it is "movable on both a vertical and transverse axis," and meets the terms of claim 4. We do not entertain any doubt that there must be incorporated into these claims, by implications, means for maintaining the contact device and the conductor in their normal working relations. Without them there is really no "traveling" contact device, and no operative combination; and the claims would cover merely an aggregation of devices which do not co-act unless assisted by some instrumentality which must be discovered and supplied. The function of the arm as constructed and arranged is to establish "moving contact" while maintaining a positive mechanical connection between the vehicle and the conductor. It was devised because as previously mounted the contact device was found to be deficient in capacity to follow the sinuosities and deflections of the conductor while the car was in motion. It can only perform this function by the aid of some instrumentality which holds it constantly in the proper relations to bridge the space between the car and the conductor and keep the contact device and the conductor in electrical connection. As pointed out in the specification, this consists of a tension device operating upon the arm and maintaining a constant upward pressure, thus holding the contact device to the conductor. This tension device, or its equivalent, is an indispensable element of the respective combinations.

That the proper construction of the claims is as thus indicated is evidenced by the proceedings upon interference in the Patent Office. Claim 2 is a literal statement of the issue defined and formulated by the Patent Office between what was then claim 1 of the application and the claims of two interfering applications. Claim 1 was as follows: "In an electric railway, the combination with a suitable contact and the supply conductor suspended above the track, of a car provided with a swinging arm carrying a contact device in its outer extremity and means for imparting upward pressure to the outer portion of the arm and contact, to hold the latter in continuous working relation with the under side of the supply conductor substantially as de-

scribed." In formulating the issue the office omitted as unnecessary, because necessarily implied, the elements enumerated in claim 1 of the application which are not enumerated in claim 2 of the patent. One of these elements was "means for imparting upward pressure to the outer portion of the arm and contact." This element was apparently thought to be indispensable to the operativeness of the combination of the claim as was "a suitable track," an element also omitted.

The appellee concedes that the claims are for combinations specified in other claims of the patent, which by our former decision was held to be void, if they require the construction which we have placed upon them. Indeed, claim 6, which we held to be void, is identical in terms with claim 1 of the interference proceedings, the claim which the Patent Office regarded as embodying the invention covered by present claim 2. The rule of construction which usually obtains hereby the several claims of a patent are to be differentiated, so that effect may be given each, cannot be reasonably invoked in behalf of this patent where so many of the claims are duplicated.

The order granting a preliminary injunction is reversed.

**NEW SLEEPING CAR LINE TO INDIANAPOLIS,  
 LOUISVILLE AND THE SOUTH.**

Commencing May 30, a through sleeping car line will be established between Toledo and Louisville via the C., H. & D. and Pennsylvania lines, leaving Toledo at midnight, arriving at Indianapolis at 8 o'clock in the morning and Louisville about 11 o'clock. This will make the best line that has ever been opened between Toledo, Indianapolis and Louisville. On the return trip car will leave Louisville about 4 p. m., leave Indianapolis at 7:30 p. m., Dayton 11 p. m. and arrive in Toledo in the early morning.

Street cars are again running at Janesville, Wis., after the shut-down for the winter.

## NEWS NOTES.

AKRON, O.—The receivers of the Akron Street Railway & Illuminating Company have received authority to issue \$150,000 of certificates to make needed improvements.

ALLENTOWN, PA.—Col. S. D. Lehr, who has been trying to revive the Kutztown trolley road, has disposed of the franchise to the Allentown & Kutztown Traction Company, which has applied for a charter. The new company will lease the road of the Allentown & Reading Electric Railway.

AMHERST, MASS.—The Amherst and Northampton Electric Railway Company has been refused a franchise by the selectmen of Amherst.

ANACONDA, MONT.—Manager Wharton has let contracts for the grading of the electric railway extension.

ASBURY PARK, N. J.—By order of court the Asbury Park & Belmar Street Railway was sold March 17 to Col. George B. L. Harvey of Asbury Park, and Acton C. Hartshorne of Freehold for \$53,000.

ASHTABULA, O.—Thomas Fricker is one of the prime movers in the scheme for an electric railway between Conneaut and Unionville, for which E. L. Hills, of Jefferson, and A. B. Martin, of Geneva, have been getting right of way.

ATLANTA, GA.—The Atlanta Consolidated Street Railway Company will extend its West End line to Fort McPherson barracks. Other extensions may be made by the company on Lee and Smith streets.

AUBURN, N. Y.—Clifford D. Beebe, president of the Auburn City Railway, has purchased for \$7,000 the large interest of Wilson H. Pixley in the Auburn Interurban Railway, and the latter company will at once construct the contemplated line of the Auburn & Western Company.

BALDWINVILLE, N. Y.—The Baldwinville & Liverpool Railway Company has been granted a franchise to build and maintain an electric railway through the town of Van Buren.

BALTIMORE, MD.—The Baltimore and Washington Transit Company filed a mortgage March 30, upon all its property, to the Guarantee Security, Trust and Deposit Company, of Baltimore, to secure an issue of 1,000 bonds of \$500 each, to be sold to pay for the construction of the road. Of the bonds 100 are to be given to the Montgomery Construction Company, of Baltimore, for the construction of an extension of the road.

BEAVER FALLS, PA.—A repair shop is being fitted up by the Beaver Valley Traction Company.

BENTON HARBOR, MICH.—The Benton Harbor Terminal Railway has been granted a franchise to run its tracks into the city along Tenth street to the canal. George Ellers of New York, and Milton Weston of Chicago, are promoting the road.

BENTON HARBOR, MICH.—A franchise for an electric railway to Dowagiac and Kalamazoo is asked by Col. George H. Allers and Milton Weston, of New York.

BERLIN, WIS.—Right of way for the Oshkosh-Ormo-Berlin Electric Line has been granted by the town of Berlin, and has now to be brought before the Berlin city council.

BIRMINGHAM, ALA.—The Birmingham Traction Company has purchased the North Birmingham dummy line.

BRIDGETON, N. J.—A franchise to extend its line four miles to Falton has been granted to the Bridgeton & Millville Traction Company.

BROOKLYN, N. Y.—Permission to change from horses to the overhead trolley has been granted to the Van Brunt Street & Erie Basin Railroad by the state railroad commission.

BROOKLYN, N. Y.—The Long Island Electric Railroad, at its recent annual meeting, decided to extend the road from Jamaica to Freeport. The new officers are: A. R. Hart, president; Charles A. Porter, vice president; William L. Wood, treasurer; J. C. Von Arx, secretary.

BUFFALO, N. Y.—The Buffalo Valley Railroad Company has been incorporated to build 27 miles of road from the city lines at Clinton street to the village of Java, Wyoming county. Freight and passengers will be carried. The directors of the company are: Luther S. Burt, Steadman Bent, of Philadelphia; Edgar C. Felton, Mason D. Pratt, of Steelton, Pa.; H. P. Bissell, Henry Metcalf, George A. Ricker, and C. W. Ricker, Buffalo; Joseph R. Ford and F. W. Wood, Baltimore; Charles W. Reinboel, Harrisburg, Pa., and Benjamin Watson, Strykersville.

BUNTON, ME.—The promoters of the Saco River Electric Road have issued \$300,000 20-year, 5 per cent gold bonds and floated them with the Massachusetts Loan & Trust Company.

CAPE MAY, N. J.—The Five Mile Beach Railway Company has applied to the borough councils of Anglesea, Wildwood and Holly Beach for the right to build a trolley line through the three resorts, to extend across the shore to the mainland.

CHARLESTON, S. C.—The Charleston & Seashore Railroad has made surveys and will build 7.5 miles of road. Dr. J. S. Lawrence of Charleston is president.

CHARLEROI, PA.—The Charleroi, Bellevernon & Fayette City Electric Railway has been placed in operation.

CHATHAM, ONT.—C. W. Richardson is one of the promoters of a scheme to build an electric railway to Rondeau Park.

CHATTANOOGA, TENN.—The Chattanooga Electric Railway is about to be extended to Rossville, Ga.

CHICAGO, ILL.—The Chicago, Milwaukee & St. Paul Railway Company's trolley ordinance was passed at the meeting of the city council April 6. The ordinance grants the railway company the right to use electric power, compressed air, or other power on its Evanston division from Kinzie street to the north city limits. The company is to pay \$5,000 for the privilege of erecting poles and trolley wires.

CINCINNATI, O.—The contract for the construction of the Cincinnati & Hamilton Electric Street Railway from Hamilton to Cincinnati, has been awarded to Chrisman & Werkel, of Cleveland, the price to be \$350,000. The road will be in operation in July.

CLEVELAND, O.—The Cleveland, Burton & Eastern Electric Railway Company has been organized with \$1,250,000 capital to build a road from the Big Consolidated tracks on Cornell street, through Gates Mills, Chester cross roads and Fullerton, to Lake Punderson, which has been purchased by the capitalists interested, for improvement as a summer resort. Among those interested are E. G. Tillotson, H. Clark Ford, Howard White, R. H. Harmon, Charles L. Pack, and H. A. Sherwin, all of Cleveland. Construction is to begin immediately.

CONCORD, N. H.—The Concord Street Railway asks the council to grant permission to extend its lines in various directions. Main street is to be double-tracked.

CORSICANA, TEX.—A deed has been filed transferring the Corsicana Street Railway (the old horse car line) to B. R. Moffett.





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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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NO. 5

The "soulless" street railway corporations of Chicago were among the first institutions in the country employing labor to instruct their men that any positions made vacant by enlistment in the army would remain open to them whenever they returned, be the time short or long. Conductors on all lines were also instructed that the uniform of the state militia entitled the wearer to free transportation. Managers of street railways generally throughout the country bulletined their men that their places would be held for all who went to war.

The summer riding opens early this year in most sections of the country, and every indication points to a good season's business. Pleasure resorts are preparing to open June 1 and managers should this year begin to receive some tangible returns on the work and expenditures of the past, in getting these resorts in attractive condition. Several new features are on the market, and an effort should be made to provide as many original and novel attractions as the local conditions warrant.

To us, who are so familiar with the effect upon the value of contiguous property which has invariably followed the building of a street railway, the fact that the English promoters of overhead trolley roads have to combat the fear that they will depreciate property, seems odd. As will be

seen, however, by referring to the letter from our English correspondent on another page, the testimony of those who have been in a position to observe the facts is unanimous in stating that the overhead lines have increased the value of abutting property there, as here.

The annual conventions of the Illinois Street Railway Association, and the National Electric Light Association, both of which meet in Chicago on the same dates in early June, will call out a large attendance. Excellent programs have been arranged; the local committees intend to provide entertainments which will be in keeping with the usual Chicago style, and the occasion is anticipated with great pleasure and interest by the entire railway and electrical fraternity of our city.

It is gratifying to note the growing tendency on the part of companies to not only expose but demand punishment in the case of illegal claims. It certainly is a duty each company owes not only to itself, but to all the others. The determined and successful efforts in Chicago and Brooklyn within the past few weeks, which resulted not only in having the damage cases thrown out of court, but also the indictment of the perjured claimants, is a matter of congratulation, and cannot fail of a salutary effect, for a time at least, in discouraging others from running the risk of detection and punishment.

The manner in which the public each year receives more for its money from street railway companies is well brought out in the Report of the Massachusetts Railroad Commissioners for 1897, an abstract of which will be found on another page. In 1897 as compared with 1896, the number of passengers carried in the state increased 5.6 per cent, while the number of round trips increase 9.2 per cent, and the car-miles run increased 15 per cent. That is, the number of round trips increase two-thirds as fast again as the number of passengers carried, and moreover each trip was on an average 5 per cent longer than in 1896. It is the increase in the facilities furnished the public, which is at a more rapid rate than the increase of traffic that takes the profits that would ordinarily result as the territory becomes more densely populated, and keeps the street railway earnings at a nearly uniform figure from year to year.

Elsewhere in this issue will be found an abstract of a lecture on "Electric Power Companies and Their Relations to Municipalities," by A. E. Lang, president of the Toledo Traction Company, and of the American Street Railway Association, which was delivered at Purdue University, La Fayette, Ind. This is the first of a special course of lectures in the electrical department, which are to be given by men who are at the head in various branches of the many electrical industries; the second lecture in the course is to be that of Mr. Insull, president of the Chicago Edison Company, on May 17. The course is similar in plan and scope to that inaugurated two years ago in the department of railway engineering, save that it covers the electrical field.

It is complimentary to the institution and gratifying to its graduates that men so busily engaged in practical affairs have the inclination, and give the time necessary to take part in this work. The advantages to the students who are thus enabled to look at many questions through the eyes of those

occupying a standpoint quite different from that of the text-writer or instructor, are evident. At the same time it occurs to us that the advantages are to some extent mutual, for this reason: When graduated the electrical men will for the most part find their work with the great corporations such as those managed by Mr. Lang or Mr. Insull, and if the latter can help to train their future assistants, they will secure more efficient men when the time to use them comes.

A reference to the article on "Pleasure Resorts for 1898," in this issue, will show that the vaudeville show is by far the most popular and successful feature for street railway parks, where anything in the way of evening entertainment, other than music, is justified by the patronage drawn to the resort. Music always has been and probably always will be the great stand-by. The favor with which the vaudeville performance is regarded for such resorts is probably due, quite as much as anything else, to the fact that the entertainment consists of a large number of short sketches, so that each number on the program is independent of the others, and a spectator may come in at any time during the evening, without having his enjoyment decreased because of having missed the earlier part of the performance; in this it resembles the concert. Another reason is that while people like to attend the theater they prefer to seek amusement rather than instruction, and the variety show caters to the first. There are a few managers who find, however, that their patrons do not take kindly to any theatrical entertainments, and that electric fountains and fireworks prove to be better drawing cards; but a fountain is such an elaborate affair that its place is in a city park only, and the small road can not hope to make it a financial success. For the children nothing is a better attraction than the old friend of our youth, the merry-go-round; it is always a money-maker. When we remember the severity of the roller-skating epidemic, it is easy to predict that the foot-cycle will ere long prove to be one of the best attractions for summer parks.

The object of pleasure resorts is to encourage pleasure riding, and if the manager can make his park or theater self-sustaining from the gate receipts or by selling privileges he is particularly fortunate; most of them in fact run the park at a loss and recoup themselves from the fares. In a small town the luxury of a park or entertainment at the terminus of the line cannot be afforded and the pleasure riding must be promoted by other means. As people always prefer to make a continuous journey rather than a broken one, a trip over a line with a loop is more attractive than one over a line which comes to an end, the return being necessarily over the identical route as the ride out. Where the town really needs a street railway it will soon need extensions and where these can be arranged so that loops of a mile, or even a half mile or less, on a side will result, the summer evening and Sunday traffic will be greatly encouraged. We have in mind a small road comprising several lines joining at a central point to which extensions were added, and so located that two loops were formed; the traffic was nearly doubled in the next two years, a great portion of the increase being from pleasure riding, to which before there had been but little inducement. In this instance no special accommodations were provided for those who merely wished to take a ride but it appears to us that on roads similarly situated, one

or two cars which would make one or more continuous trips over the entire line, and carrying signs denoting that they were particularly for pleasure riding, could be added with profit. It is always easy for a resident who is familiar with the car service to arrange such a ride, but special cars would appeal to strangers in town who might otherwise fail to avail themselves of this way of passing an hour or two only because they were unaware of the opportunity.

European residents who have never visited America, and who consequently measure the capabilities of our people by existing conditions at home, will hardly be able to comprehend the universal spirit of patriotism which animates the Nation. We have had scarcely any standing among the great nations as a military or naval power, and non-residents cannot believe that a people so devoted to the peaceful and industrial occupations have much out of which to produce a fighting body on either land or sea. The splendid victory of Admiral Dewey should open their eyes, but should the war be prolonged, and even before its close we may expect an exhibition of American skill and courage which will create a sensation. The harder a proposition the more anxious are we, as individuals and a people, to undertake it, and Europe will discover that, while slow to fight, when we do fight it is with the same irresistible force and energy which has swept aside engineering difficulties previously considered impossible to overcome. A million men volunteered at the call for 125,000, and if necessity demanded, five million could be raised in a month; and the rapidity with which they would be transformed into well drilled, disciplined troops could not be equalled by any other country on the globe.

Everybody is interested in the war, and anything which pertains to the army and navy attracts young and old alike. Managers of pleasure resorts have a suggestion in this to add to the features of their parks. One company already has taken the miniature battleship which paraded the tracks mounted on trucks and motors and has placed it on a scow and anchored it out in a little lake on the grounds. The ship is attracting quite as much attention now as it did on land, and other boats of a similar character can be quickly and inexpensively built in any company's shops. Nothing could be better as a Fourth of July attraction, and if an occasional salute is fired, and smoke poured from its stack, the picture would be one to draw from far and near.

While on the subject of war features as attractions, cinematograph and stereoptican views of battleships should not be forgotten. These can be produced at very small expense for each exhibition, and will easily take the place of the expensive theatrical troupes. Those concerns which make a business of furnishing instruments and views have already secured a large number of strictly up-to-date war pictures, and later we may expect photographic scenes of the engagements, as every possible effort will be made to secure views.

The effect of the war on proposed electric railway operations has, of course, been to hang up all which have not previously completed their financing. Of these there are



a very large number, and we all hope for a speedy and decisive action with a final settlement within the next 30 days. This, in the opinion of many competent to judge, seems highly probable. The immediate effect on American stocks, in both the London and home markets as a result of the Manila victory, is taken to indicate the prompt release of money, now hesitating to embark in industrial and railroad lines, which will occur when the war is ended, or even if the time of the end is approximately known.

In our opinion, as events are moving now, our war with Spain should have passed into history within the next 60 days, and quite possibly in less time. To accomplish this, however, it will be necessary for our government to imbibe some of the spirit of the intrepid Dewey, and let its blows fall as quick and heavy. The business interests of the country and the people are anxious for action to be pushed with that intense energy for which the American nation is famous.

When once the end is reached we can pick up the deferred operations where they were dropped on February 15th, and the universal belief is business of all kinds will bound into activity not enjoyed for several years past. As it is, most lines of business are doing finely in spite of war, and many concerns in street railway supplies report larger sales for the current month than any time during the past three or four years.

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#### COST OF POWER VS. COST OF REPAIRS.

At a recent meeting of the Chicago Electrical Association the question was raised as to whether too much thought has not been given to the efficiency of railway motors as against a low cost of maintenance. Some of the gentlemen present spoke very strongly to the effect that the repairs needed even on modern motors are excessive and that they would not consider it a bad idea if the cost of repairs could be reduced even if the efficiency of the motor was reduced so as to make the power cost more. As the gentlemen involved in the discussion were of considerable experience and hold prominent positions in the electric railway field their opinions bear considerable weight and make the subject worth investigating.

The cost of power is usually roughly considered as 10 per cent of the total operating expense, and this fact is pointed to sometimes to show how small a reduction in the total operating expense a reduction in the cost or amount of power used would make. Nevertheless a dollar saved in power is just as good as a dollar saved anywhere else around a system and very often saving in power can be made without interfering with the service when saving in other directions would cause trouble or dissatisfaction. Furthermore, even if the cost of power is small the cost of motor maintenance is still smaller. The cost of motor maintenance is such an extremely variable quantity from year to year on different roads that no general rule can even approximate this item.

On 18 Connecticut roads reporting to the Connecticut railroad commission for the year ending September 30, 1897, the average cost of repairs on car equipment was \$.00474 per car-mile. The lowest road was \$.0005 and the highest \$.0105, so it will be seen the cost varies enormously. From an inspection of the maintenance figures per car-

mile on a large number of street railways the writer is led to believe that \$.005 per car-mile is not far from an average figure for the maintenance of motor equipments. It may be lower than this on some roads for certain periods but it will usually be made up for by renewals at some subsequent time. It may also be higher than \$.005 due to local conditions or to poor management. In fact the question of management of details in the repair and inspection department has so much to do with the cost of maintenance that it is almost impossible to say what the cost ought to be. Nevertheless assuming as a basis that the average cost of \$.005 per car-mile is about what good management will show, it becomes apparent that to seek for economy in maintenance at the expense of power is hardly a sound financial policy, since power costs from \$.01 to \$.03 per car-mile on well managed roads. A reduction in motor efficiency would necessarily have to result in a saving of a large per cent of the total repair expense to be able to offset the increased cost of power. On a road where power costs \$.01 per car-mile and motor repairs \$.005 a 10 per cent increase in power expense would counterbalance a 20 per cent reduction in maintenance expense, and if power cost more (as it does in the majority of cases) the repair bill would become still smaller in proportion to the cost of power. One thing must be kept in mind in this connection, namely, that to a certain extent inefficiency and high repair bills go hand in hand for the reason that loss in efficiency in some directions manifests itself in heat and this heat destroys insulation. However this covers only part of the question. Other things being equal the larger a motor under a car for doing a given work the lower will be its commercial efficiency, and the less will be the strain on its insulation and mechanical parts, which strains are the cause of repairs. In other words at the present day it is mainly a question of whether it pays to equip with motors large in proportion to the work to be done for the sake of saving repairs at the sacrifice of a higher cost of power, an increased investment in motors and an increased investment in power generating and transmitting plant. It does not appear, with costs of power and maintenance running as they are at the present time, that there is need of any general increase in the size of motor equipments above those usually accepted as standard for common classes of service. There are no doubt places where excessive repairs even with good management point to the advisability of larger motors, but these are the exceptions rather than the general rule. It must be remembered that careful, intelligent attention to, and study of details has more to do with success in keeping up motor equipments than anything else. The quality of the bearing metal, the treatment of commutators, the attention to cleanliness inside the motor case and the conscientiousness of the men employed are of vital importance and upon care or carelessness in these regards much of the variation in cost of motor maintenance under apparently similar conditions depend.

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The West Chicago Street Railroad Company has seven new 3,000-gal. sprinkling cars, the product of its repair shops. Each car is provided with two G. E. 800 motors.

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It has been suggested that the elevated railroad companies operating over the Brooklyn bridge rent the bridge cars and take passengers across the bridge at the present rate 2½ cents, the bridge ceasing to operate any cars.

## COUNTERWEIGHT SYSTEM IN ST. PAUL.

St. Anthony Hill in St. Paul is one of the choicest residence districts of the city, and the hilltop view up and down the Mississippi and across its valley is one never to be forgotten. One of the principal means of access, because the most direct, is via Selby avenue, which by a more circuitous route attains the elevation of over 100 ft. which along the river bank only a few hundred feet away rises in a sandstone cliff almost as smooth and straight as a wall.

It has always been difficult of access, and much as transportation was desired the horse car never ventured its ascent. When cable construction was introduced it was gladly seized upon as a solution of the problem, and operation has been very successful with the one exception of the runaway accident about 10 years ago, which cost the company \$180,000. The company has for a long time been extremely anxious to standardize its motive power, and operate entirely by electricity, and but for this short hill section would have done so long ago. For two or three years past all kinds of devices have been presented and rejected, and it was not until the Bronsdon system—invented by M. H. Bronsdon, chief engineer of the Union Railroad, Providence—was brought out,

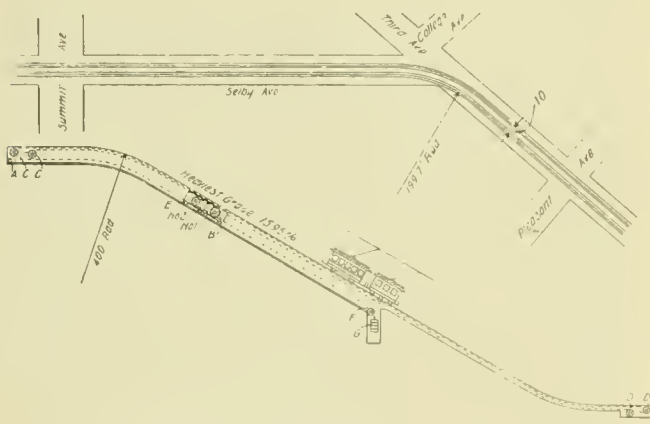


FIG. 1.—DIAGRAM OF GENERAL ARRANGEMENT.

that the way seemed clear to take out the cable. The construction work is progressing nicely, and when completed electric cars with heaviest loads will travel the grade in either direction in perfect safety and at a good rate of speed. The improvement is one most needed in the St. Paul system; and company and citizens alike are to be congratulated on the change.

The term, compound, used in connection with this particular system refers to the manner of arranging the cable, as will be explained later, the object being to have the weights travel but one-half the distance traveled by the car. The counterweight system is to replace that part of the cable railway now in operation known as Selby Hill, while the entire road is to be equipped with electricity. Cars weighing from 15,000 lbs. to 30,400 lbs. will be operated on a two-minute headway. A grip car will be used to move the passenger cars both up and down the hill. When in operation, the grip car will always be on the lower end of passenger car when on the grade; i. e., the grip car will be behind the passenger cars while ascending, and ahead of passenger cars while descending the grade. The object of this is, that in case the draw bars between the grip and passenger cars

should become inoperative, the passenger car cannot run back down the grade, but will be obstructed by the grip car. The use of the grip car removes the necessity of placing special attachments upon the passenger cars and a car of any weight may be moved over the grade by its use. The grade begins at the foot of the hill with a rising grade of 5.01 per cent and increases gradually to 15.95 per cent to the summit, where it falls to 3.66 per cent. Part way up the grade is a horizontal curve of 199.7 ft. radius. This horizontal curve, extending as it does into the rising grade (or more properly termed the vertical curve), complicates the engineering difficulties in the design of this work. Cable railway engineers will readily understand the difficulty of passing a cable through a horizontal and vertical curve at the same time. To accomplish this, the vertical curve was made parabolic and extended down into the horizontal curve, the lower tangent point of the vertical curve coming near the apex of the horizontal curve. The general arrangement will be about the same as the system in operation at Providence, R. I., which was described in the REVIEW for April, 1896, the only difference being that no draw bar is to be used to connect the counterweights.

Practically all the delays and mishaps of counterweight systems have been caused by the failure of the cable fastenings and counterweight draw bar connections. This does not apply to the "compound system" alone, but to any of the systems of counterweights. As mentioned above, no draw bars are to be used to hold the weights together but the cable is used instead. By referring to Fig. 1 it will be seen that the cable is lapped by itself, extending from the top of the incline down to the counterweight lowest on the grade. The cable, therefore, pulls the weight designated as No. 1 and this weight pushes No. 2 before it. Also, the tension of the cable serves to hold the counterweights together. As will be seen, the cable is fastened at A and passes down the tunnel to weight No. 1 (passing by weight No. 2), around the sheave placed in weight No. 1 and back up the hill to and around the sheaves C, C, at the upper terminal, thence down the entire length of the hill, to and around the sheaves D, D, set at the lower terminal, back up the hill to weight No. 2 (passing by weight No. 1), to and around a sheave set therein, and back to and over the tension sheave where it is fastened to a tension weight in a pit. It will readily be seen, therefore, that (by this arrangement of the cable and counterweights) no draw bar connection is needed to hold the counterweights together. It must be understood that Fig. 1 is not taken from the working drawing but is simply a diagram to show the manner of laying the cable and counterweights.

Reference to the general plan, Fig. 2, will make clear the arrangement of the tracks in general, with the crossovers at either end, and also show the grades and curves. The track rails are to be Johnson 5-in., 80-lb. T, except on the horizontal curve where Johnson 6-in., 92-lb. guard rails will be used; the slot rails are Johnson 7-in., 70-lb. Z-bars. The rails in the conduit for the counterweight are also 5-in., 80-lb. T. All the special work is the Johnson "guarantee."

As explained before, the counterweights move over but one-half the distance that the car moves, and hence the different portions of the conduit differ in construction. On the upper portion, where a track must be provided for the counterweight, the section is as shown in Fig. 3 (a section on E, E, Fig. 2), which shows the construction, with the yokes,



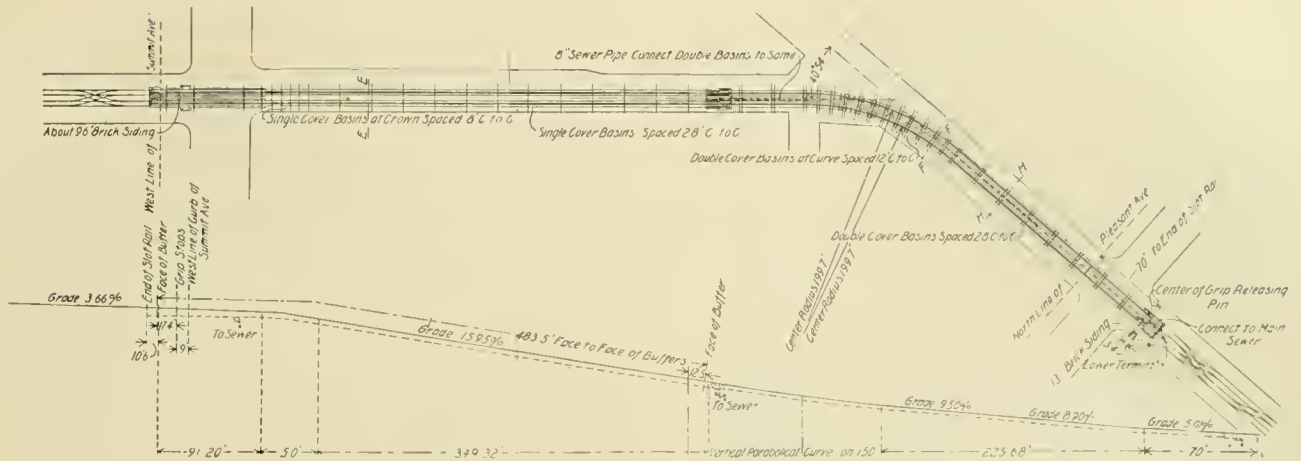


FIG. 2—PLAN AND PROFILE OF SELBY HILL LINE.

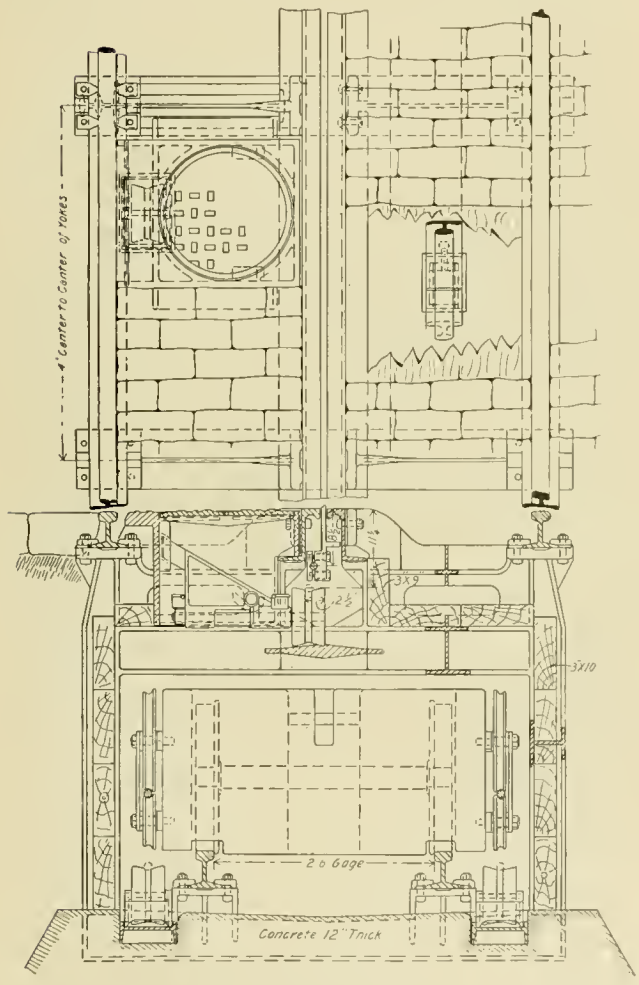


FIG. 3—SECTION ON E, E.

grip, carrier pulleys, counterweight, manhole and wood siding in place. The yokes are of cast iron and spaced 4 ft. between centers.

Fig. 4 shows the construction used on the lower half of the hill excepting at the horizontal curve, which is shown in Fig. 5. Fig. 4 is a section on H H looking up hill, and Fig. 5 a section on F F looking up hill. The basins on the lower portion of the hill are all double cover basins, while those on the upper portion are single cover basins, shown in plan in Fig. 3. These sections (Fig. 4 and 5) show the yokes,

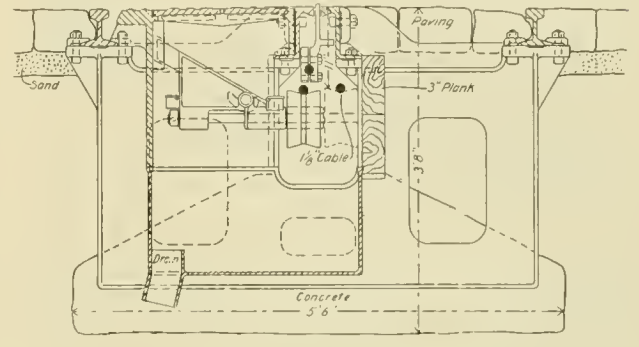


FIG. 4—SECTION ON H, H.

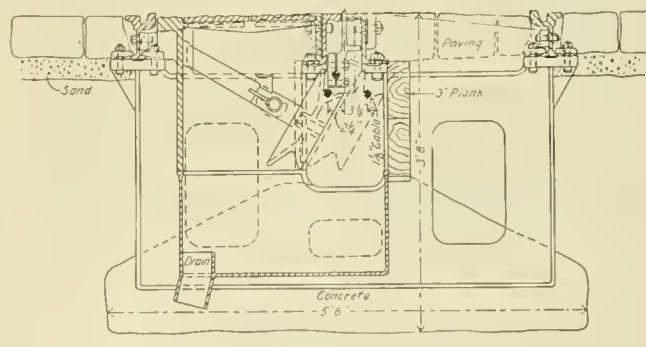
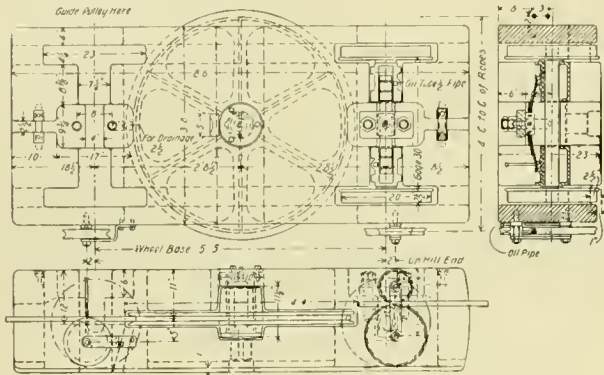


FIG. 5—SECTION ON F, F.

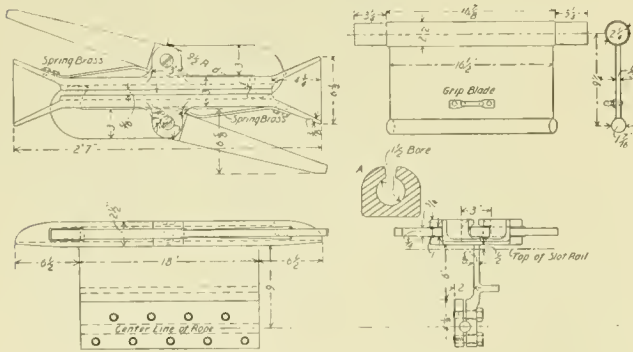
curve and carrier pulleys, manholes, rails, drain and siding as assembled.

Fig. 6 shows the head counterweight, the right hand end being the up-hill end, with the parts assembled. The counterweights are carried on 20-in. wheels, with 3-in. axles. The axle boxes are of the best phosphor bronze and beneath the bronze box is an oil cellar which holds about one pint of oil. In the oil cellar is a wooden feeder which bears against the axle, the whole length of bearing, thus giving continuous and perfect lubrication. Above the boxes is a half elliptic steel spring, to take the shock of uneven track and poor joints. The 48-in. sheave which is placed in the counterweight is provided with a cast steel stud to run upon. This stud is hollow and is filled with oil, which is also fed by a woolen wick, thus insuring continuous lubrication. All bearing surfaces are made large to insure continuous wear. The weight per inch of bearing surface is in no case more than 200 lbs.

The gripping device is entirely automatic in operation and is of the same design as those which have been used in Providence since October, 1895, and have worked with entire satisfaction. The device is shown in Fig. 7. The portion fastened to the cable is a flanged steel casting, comprising a slotted shoe carried above the slot rails and a blade 18 in. long, which projects 8½ in. into the conduit and is permanently clamped to the cable, by means of a plate and nine ¼-in. set screws. The shoe is 31 in. long; in the center is a slot bored out to the section shown at A, Fig. 7; at the



ends the shoe is flared to guide the grip blade into the slot, and at the sides is provided with lugs to which are pivoted the releasing levers. The releasing levers are kept in their normal positions by brass springs, and are tripped by striking pins which are placed at the ends of the incline. The grip blade is 9½ in. from the center of the bearings in the



car to the center of the enlarged lower portion engaging the grip. It is steel casting hung in bearings on the grip car so as to be free to swing sidwise. The automatic working will be readily understood from the drawing.

All the castings and machine work are being furnished by the Sessions Foundry Company, of Bristol, Conn., which probably has the largest and best equipped foundry in New England. It was awarded the contract on March 12, and guaranteed to deliver all material, finished, May 20, thus having but 59 working days to turn out about 270 tons of material and finish the necessary machine work.

For the foregoing description and the drawings we are indebted to Mr. Bronsdon.

POSITIONS FOR ENGINEERS IN THE NAVY.

Among the war measures is an act of Congress for securing volunteer officers in the engineer corps of the navy. The Examining Board meets in Philadelphia to examine candidates, and the successful applicants will be assigned to the grades of acting chief engineer, with the relative rank of lieutenant; acting passed assistant engineer, with the relative rank of lieutenant and lieutenant junior grade, and acting assistant engineer with relative rank of ensign.

The men in actual charge of the engines and boilers are ordinarily enlisted for three years, but at the present time enlistments are made for one year with the proviso that the men may withdraw or be discharged within that time if their services are no longer needed. All applicants for enlistment in the navy must be of robust frame, intelligent, of sound constitution, and free from serious physical defects.

The three grades of "machinists" (the men having charge of the engines) are:

- Chief machinist ..... \$70 per month.
- Machinist (1st class)..... 55 per month.
- Machinist (2nd class)..... 40 per month.

Chief machinists are not ordinarily enlisted but work up to the grade; now, however, a man with first-class marine papers may enlist in that grade.

Candidates for enlistment as machinists must be machinists by trade, know the names and uses of the various parts of marine engines and boilers, and be able to work with machine shop tools. They must be able to write legibly, and understand arithmetic. The age at the date of first enlistment must be between 21 and 35 years. Those who have had one year's experience at sea with marine machinery may enlist as "machinists, first class," and those without experience as "machinists, second class."

Chief machinists will have charge of engine-room watches. Machinists, first class, will be given charge of watches, if there are not a sufficient number of chief machinists on board. Machinists, second class, will be assigned to duty as oilers and water tenders.

For the other ratings, the applicant must be between 21 and 35 years of age and thoroughly understand his trade. The pay is as follows:

- Boilermaker ..... \$60 per month.
- Blacksmith ..... 50 per month.
- Coppersmith ..... 50 per month.
- Plumber and fitter..... 45 per month.
- Fireman, first class..... 35 per month.
- Fireman, second class..... 30 per month.
- Coal passer ..... 22 per month.

The men of all ratings are entitled to one ration (three meals per day). Applicants must present themselves at the receiving ships or navy yards for examination at their own expense. No person who does not understand and speak the English language can be enlisted. Preference will be given to those who can read and write and are of American birth or have declared their intentions of becoming citizens.

The case of the Detroit Citizens' Street Railway Company against the Detroit Electric Railway Company and the city of Detroit was argued before the United States Supreme Court on April 19 and 20, and a decision is expected some time during the current month.



## DON'T WORRY ABOUT OUR ELECTRICIANS.

ELECTRICITY IN WAR.—Now that the United States is (owing, as some people think, to her meddling disposition) within measurable distance of a foreign war, her citizens are seriously beginning to look about and examine whether patriotism and self-confidence are a sufficient equipment for beating a proud nation to its knees. The "Boston Transcript" has published a long article on the necessity of enrolling a body of electrical engineers for service on ships and shore batteries. We are sanguine enough to believe that in an English man of war, at any rate, the proportion of electricians amongst the crew is sufficiently large to eliminate any such danger as long as the ship is afloat—to say nothing of the fact that failure of electrical power is anticipated and its worst consequence guarded against by the alternative hand gearing in all departments. But then with us the citizen is not quite too much engaged in money-making to join either service except as an officer, and with all our shortcomings we can man our army and navy in all departments from the British horn. This is hardly so in the states, and the coming fight—if, alas! it is to be—will present several interesting problems for solution. Will the mercenary foreigner who composes so large a proportion of the United States regular forces earn his salt? Will discipline, so conspicuously absent from the American citizen, be suddenly evolved from the very circumstances which are admitted to be the cause of its greatest strain? These are queries which concern us vitally, for, after all, behind our "thin red line" stands as the backbone of our home defences a "citizen army" not unlike that with which America enters on a war of foreign conquest with a deal of shouting and a light heart.

The above extract is taken from "Lightning," of London, and is a sample of such expressions which are given prominence in the newspapers of England and the Continent, and are reflected in the technical press. As the editors of "Lightning" and other English papers have visited the United States, it is strange that such false views should receive even their passive sanction.

Such criticisms fall under three headings, viz.: The United States government, under the guise of humanity, has inaugurated a meddling foreign policy and is now carrying on a war of conquest. The people of the United States hold money as their god. The American citizen is not amenable to discipline, therefore the army and navy are ineffective.

The first assumption is exceedingly unjust in view of foregoing events. "I am my brother's keeper" is the principle upon which each individual nation as well as the concert of Europe acts. The outcome of the Greco-Turkish war, the partition of Africa, and the dismemberment of China are all evidences of this. The British government was subjected to caustic criticism by the English people because it did not compel by force the cessation of the Armenian massacres. The provocation to interfere in another nation's affairs has been greater in the Cuban question than any that has confronted Europe in a generation. The character of the war is inhuman and great numbers of non-combatants were wilfully caused to perish; the Cuban trade with the United States, which amounted a few years ago to \$100,000,000, dwindled to nothing; the war so near our shores was a constant source of expense and irritation to the government, and as a climax came the treacherous destruction of a United States battleship in Havana harbor. All these combined make it safe to say that no European nation would have suffered with such forbearance as has the United States.

The Americans are essentially an industrial people, but it has been demonstrated many times that they are as ar-

dent and energetic in philanthropy, in war or any other undertaking as they are diligent in business. The greatest expenditures of thought and money for charity and education have not been made in countries of Europe or even in England but in the United States, and the greatest organizations for humanity are to be found in the same place. When, for a righteous cause this energy of the American people has been turned into the prosecution of war, it has been a matter of surprise to Europe. The English found to their sorrow that the Americans, reared in peaceful pursuits, soon made such good soldiers that even Wellington's veterans met with crushing defeat at New Orleans. The campaign against the Spanish-Americans in Mexico was not surpassed by the feats of the British arms in India. Our contemporary must not mistake the "mercenary foreigners" in the navy and army for Hessians. Of course there are soldiers and sailors foreign born, but the vast majority are of native birth. If their loyalty, efficiency and discipline have not been already demonstrated in other trying times they certainly were in the naval battle in Manila bay. The victory of Dewey's squadron was unprecedented in that the enemy's fleet was entirely destroyed in battle without the loss of a ship or man.

The fear of a dearth of electricians for the naval service is illfounded, for the engineers of the United States not only surpass those of any other country in numbers but also in accomplishments. The mileage of the electric street railways in the whole world is insignificant in comparison with that of the United States. Hundreds of electricians have been trained in the construction and operation of these railways. The foregoing statements could be made in reference to the telephone and telegraph business; in fact, this country occupies a front rank in every branch of electrical industry. Even were the United States navy equal in magnitude to the great British navy, our government could surfeit the vessels with engineers. Already through the efforts of a few men, having only the sanction of the government, more than 1,000 electrical engineers have volunteered their services and many are now already serving. If our contemporary will take the trouble to inquire it will find that our equipment consists of something besides "patriotism and self-confidence."

These slighting criticisms are not given, we believe, in the spirit the words would indicate. The Englishmen have a deep sense of justice, a hatred of inhumanity and a love for good government, and it is for these that the present war is being waged. The many sincere expressions of sympathy and good-will which have been general in Great Britain and the friendly attitude of the government are greatly appreciated by all Americans and will tend to bring closer bonds of union in spite of occasional discordant notes.

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W. H. Patterson, president of the Bloomington (Ill.) City Railway, is a brother-in-law of "Fighting Bob" Evans, of the Iowa. Mr. Patterson was himself for two years a paymaster in the navy, during which time he visited all parts of the world.

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The following notice was posted at all the car houses of the north and west side systems in Chicago:

Chicago, April 19.—To the employes of the North and West Chicago Street Railroad Companies: The management hereby no-

tifies the employes of the different railroads under its control that any of said employes joining the military or naval service of the United States under a call of the President, in case of war with Spain, will be reinstated in the same place which they vacated, on their return, after being honorably discharged.

CHARLES T. YERKES, President.

Immediately after the declaration of war and the President's call for troops the following notice was posted:

Notice to Conductors: On and after this date conductors are instructed to carry members of the Illinois National Guard free while in full uniform on the cars of this company until further notice.

CHARLES T. YERKES, President.

April 23, the following bulletin was issued by the Chicago City Railway:

All present employes of this company, who are members of any military or naval organization, or who hereafter will enlist in the United States' service during war with Spain, will be re-appointed to the exact position held by them when enlisting or reporting for military service upon returning for duty within one month after being honorably discharged from the United States service.

All assessments levied against members of the Employes' Mutual Aid Association, who enter the government service as above provided, will be paid by this company, during the period of such service.

G. O. NAGLE, Superintendent.

Approved: M. K. BOWEN, President.

Among the tenders received by Colonel Young, of the 1st Illinois cavalry, was that of a pioneer corps of 100 men organized by Chief Engineer Clapp of the South Side Elevated.

A company of 103 men from the Cicero & Proviso Street Railway Company has joined one of the Chicago regiments.

William Barclay Parsons, chief engineer of the Rapid Transit Commission, New York City, is one of the many men with large incomes who are willing to sacrifice their business interests and tender their services to the Government. He is endeavoring to raise a corps of engineers, believing that the difficulties to be overcome in landing troops in Cuba during the rainy season will call for engineers of wide experience.

Capt. Eugene Griffin, vice-president of the General Electric Company, and formerly of the United States Army, has undertaken to organize a volunteer corps of 1,000 electrical engineers and skilled electricians. This corps will assist in the work of the regular engineer corps in planting submarine mines for the protection of important harbors, and will prove especially valuable in the emergency signaling, lighting, etc., which will be necessary in the military operations. The General Electric Company offered to continue on its pay roll such of its employes as wished to volunteer and assured them that their old places would be waiting for them at the end of the war.

Frank W. Hawley, vice-president of the Cataract General Electric Company and of the Erie Canal Traction Company, is another electrical engineer who has tendered his services and offered to raise a regiment of skilled electricians.

The San Antonio (Tex.) Street Railway Company on April 16 posted a notice that any of its employes who may enlist in active volunteer service will, upon their return, have their positions, and during the time they are in actual service their wages will be paid to their families.

C. K. Durbin, general superintendent of the Denver Consolidated Tramway Company, issued an order April 20, which reads:

In the event of war between the United States and Spain, the employes of this company who wish to volunteer their services to their country will be granted leave of absence for one year, and their positions will be held for them for that time.

The Denver City Railway issued a similar order.

This action on the part of street railroads is quite general throughout the country. Among other companies issuing such orders that have come to our notice are the Consolidated, of Detroit, and that at Hagerstown, Md.

William Tiffany, secretary and treasurer of the Sterling Supply & Manufacturing Company, and a prominent society man, has joined "Teddy" Roosevelt's Rough Riders, and is to be a captain, it is stated. Mr. Tiffany is a grand-nephew of Oliver H. Perry, the hero of Lake Erie. He spent several years in the west as a cowboy and became well acquainted with Mr. Roosevelt; there is no doubt about his being a "rough rider," as in addition to his



WILLIAM TIFFANY.

cow-boy experience he has long been a member of a crack polo team in New York.

#### FINE INCREASE AT NEW ORLEANS.

C. D. Wyman, general manager of the New Orleans Traction Company, is making a fine record. For the first quarter of 1898 the earnings are \$332,374, an increase over last year of \$14,688; operating expenses same period, \$190,699, a decrease of \$15,651. This makes the net earnings for the quarter \$141,705, which is an increase over the net in '97 of \$30,339.

Mr. Wyman is building up a fine business in trolley parties, and the demand now runs as high as 10 or 12 for the day and evening. New Orleans has so much of interest to visitors, who can see the sights in no way as satisfactorily, quickly and cheaply, as by chartering a car, it is likely to have the largest day trolley party cars of any city in the country.

A record was made in quick track construction in San Francisco recently. The roadbed was prepared and 80-lb. rails laid on H street, between 28th avenue and the beach, a mile in length, in four hours by 64 trackmen.



## HOW TO PROTECT TROLLEY AND FEEDER LINES.

Some Suggestions from Street Railway Electricians as to Methods for Protecting Overhead Lines from Thieves—Alarms and Annunciator Systems—Carrying High Voltage Currents at Night.

### Trolley Wires Stolen.

The street railway people reported to the police this morning that some time during the night their trolley wires on the Walnut street line outside of the city limits had been cut down and taken away. About four blocks of wire was stolen, valued at about \$100.

Scarcely a day passes that we do not note one or more paragraphs similar to this one taken from the "Milwaukee Sentinel" of April 30. There are now before the writer accounts of thefts of copper wire from the street railways in Eau Claire, Wis., Chicago and Seattle, Wash.

Such robberies generally occur in the early morning hours when the machinery at the power station is shut down and the wires are dead. The wire is taken by junk-men or tramps, as was the case in Eau Claire, Wis., two weeks ago; but it is often stolen by one who has been a lineman or other employe of a street railway company. In one instance three times in as many years a considerable portion of the trolley wires on the same line were cut up into scrap and sold. The loss to the railway company amounted to hundreds of dollars.

Some of the suburban lines have been patrolled for a time to protect the property but this is tedious and costly. The sensible thing to do is to devise some automatic electric system to give an alarm whenever the wires are being molested.

We have written to the electrical engineers of a number of roads and several have responded with suggestions as to how the lines can be adequately protected.

Fig. 1 illustrates the plan suggested by C. E. Flynn, general manager of the Carbondale Traction Company, Carbondale, Pa., who writes thus:

"It has occurred to me, that some protection against the theft of trolley or feeder wire might be derived by arranging a simple alarm system at the power house which could be arranged as follows: A series of five lamps might be con-

nected between the end of the feeder or trolley wire to the rail circuit of any one section, or it could be connected to that part of the feeder or trolley wire that is in danger of being stolen. At the power house the feeder wire could have connection with a small electro-magnet as shown in the diagram; the other side of the circuit would, of course, consist of the rail. Then by means of a storage battery which could be charged during the day time, this lamp circuit could be switched in, either automatically or otherwise after the power plant had been shut down for the night. The electro-magnet should have its armature in such position that the current from the storage battery would hold it up to the poles of the magnet, and the moment that the feeder circuit was opened, the armature of the electro-magnet should drop sufficiently to close a battery circuit in which a gong is connected as per sketch, and this would give warning that the line was being tampered with. In case several separate feeder wires were to be protected, it would be necessary to have a separate magnet, fuse block and switch for each wire to be protected, and in this case it would assist matters to have two additional contact points under each of the magnet armatures, to these contact points a series of lamps could be connected so that when the armature of the electro-magnet of any one circuit should drop and close the battery circuit, making the gong ring, it would also close a lamp circuit that would indicate which feeder wire was being tampered with."

John H. De Gruchy, of the Union Railroad Company, Providence, R. I., writes:

"In considering the protection of suburban lines against theft the cost of the inauguration and maintenance of any method must be taken into account. It is certain that the annual cost of a patrol would amount to more than a year's incidental stealings, the tying up of the line and the expense of repairs resulting therefrom, inclusive.

"The accompanying sketch, Fig. 2, will show at a glance

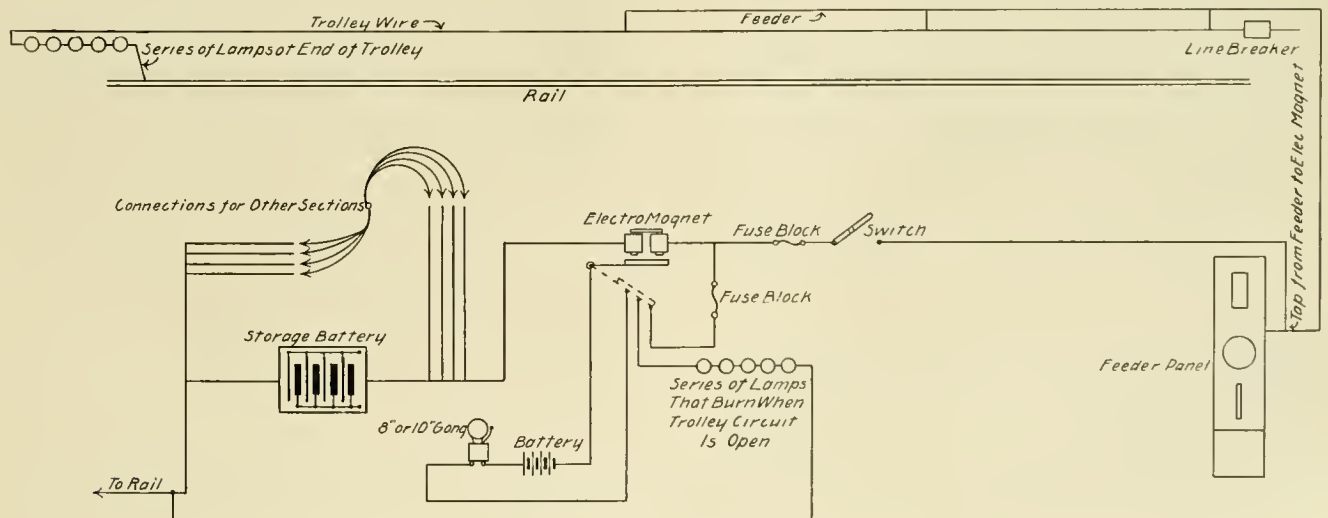


FIG. 1.

the difficulties to be overcome in order to establish an annunciator or bell system which would operate in the event of any part of the line being cut. With trolley taps every 1,000 ft. and the rails connected to negative feeders every 500 ft. an efficient annunciator or bell system would be hope-

opened at A by opening the switch at B, the resistance taken and the distance of the break from the power house approximated."

J. F. Stevens, president of the Keystone Electrical Instrument Company, Philadelphia, writes us as follows: "It seems to us that there are two ways to assist detection of theft of trolley or feeder wires when the power station is shut down at night. The simplest plan would be if a source of alternating current is available, to open all main switches at the switchboard and throw the alternating high tension circuit from the local lighting company, on to the bus-bars, keeping all feeder switches closed. The effect of this would be to give a very severe shock to any one attempting to cut the wire, and after it became known that the trolley wire at night was charged with one or two thousand volts, we think there would be few attempts made to cut wires. By attaching to the bus-bars at the switchboard all feeders, as well as the main line, would be in circuit. It would, of course, be necessary to insert in series with the line sufficient resistance to prevent a heavy flow of current.

"Another method would be to run a small pressure wire from the terminus of the circuit, back to the power house, then having opened the main switches, set in a magnetic device similar to an annunciator, in connection with several cells of gravity battery. In this plan, a circuit would be made from the bus-bars and through all the feeders to the line returning through the small pressure wires spoken of at first, and so long as the circuit was complete, the armature of the annunciator would be held against its magnet, but on breaking the circuit at any point, the armature would be released and a bell ringing circuit thrown in; thus giving a visible and audible notice of a break in the line. An indicator could be arranged for use there in the power house, or at any other point in the city at the option of the superintendent."

Notwithstanding the large amount of territory covered by the Calumet system, of Chicago, the company has had wire stolen but once, and on that occasion it was taken on a short piece of track that was not used at all. In response to our inquiry H. M. Sloan, general manager, states that he has given this subject but little thought because the losses have not made it necessary. He suggests that it might be a good idea to put a small dynamo at a very high potential on the lines at night, but adds that then there would be danger of a wire falling and killing someone, in which case the company would probably have to pay more for damages than all the wire stolen would amount to.

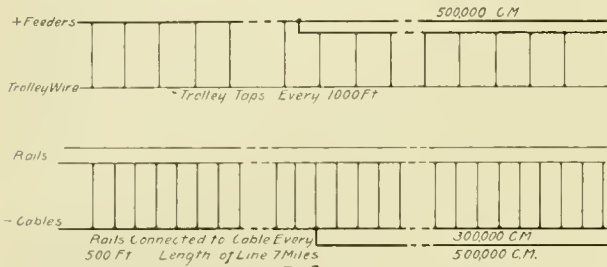


FIG. 2

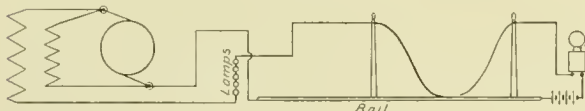


FIG. 3

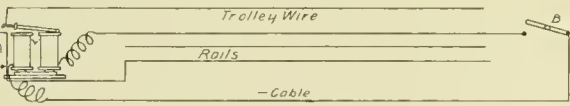


FIG. 4

lessly complicated. The detecting value of this would be, no doubt, circumvented by the thieves who could and would willingly exchange a few hundred feet of bell wire for the same length of trolley or feed wire.

"So many multiple connection make it impossible to acquire any adequate protection in this way. The cost, too, might interfere with its adoption.

"If the trolley wire should be cut when the power is off, an arrangement shown in Fig. 3 would indicate that such was the case. The bank of lamps is placed in series with the positive feeder, and will light when the trolley wire strikes the rails. A bell and battery could be used for the same purpose.

"To protect the entire line a magnetic contact maker A, Fig. 4, is required to close the circuit at the extreme end of the line which will be necessary to the object in view. Now find the resistance of the entire line from the station positive to the negative. After the galvanometer reading has been ascertained for normal condition, it is obvious that any tampering with the line circuit either by cutting the trolley wire or the positive or negative feeders will be indicated instantly upon the dial. If a trolley wire breaks the contact can be

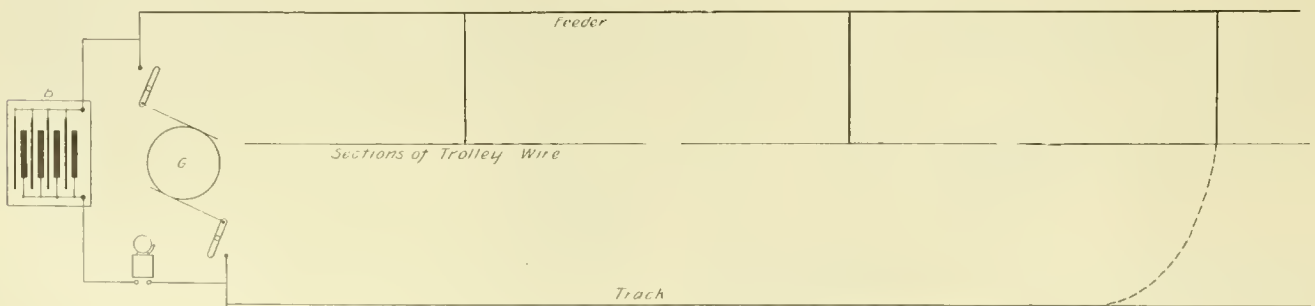


FIG. 5.



Bion J. Arnold, of Chicago, writes: "It seems to me, however, that the simplest way out of the difficulty is to leave current on the line all night by means of a small direct connected engine and generator in the power plant. Such an engine and dynamo, having a capacity of from 5 to 10 h. p. would easily keep an ordinary line charged and make it uncomfortable for any meddlers, and it would probably cost less to maintain than any kind of an automatic device that could be gotten up. If the trolley line was operated in conjunction with a storage battery auxiliary, the battery could be left on the line all night, and accomplish the same purpose, and this without any appreciable loss."

Another arrangement is described below, although modifications would have to be made for different systems. As with every other form of alarm experienced men could render it ineffective. A 500-volt battery would probably be the most desirable although that voltage would not be arbitrary. The cells could be located in any convenient place about the station and connected to the switchboard. This battery is charged from the bus bars and then cut out until the generators are shut down and the switches opened. The battery switches connect it through the bus bars to the feeders and lines. In a well regulated system there is little leakage and a battery of small current capacity, not much larger than a special testing set, would serve the purpose and keep the lines at a potential near 500 volts.

An alarm bell, with one or more relays if desired, is in the circuit with the battery and line. This plan would be effective in most cases for there are few persons who have the hardihood to handle a wire charged at 500 volts without proper facilities, and there is little chance of wire thieves being provided with rubber gloves, reels, tower wagons, etc. If a wire should be cut and fall to the ground the circuit would be complete through the line battery and bell and an alarm would be sounded. The expense of the battery would be an item, but its cost would be saved many times in preventing the robbery of a section of wire with the accompanying expense to the company in replacing it, and in the delay to traffic.

Our readers are invited to suggest simple and effective methods for an alarm which can be easily and cheaply installed. In the main lines of the larger cities, of course the lighted streets and police patrol nightly leaves little danger of trouble there; but on outlying sections, and lines reaching out into the suburbs, which often pass for a considerable distance through sparsely settled or unoccupied territory, some system of alarm is greatly needed. And it is not always the electric lines passing through lonely spots in the country that suffer the loss of trolley wire as a recent experience of the Metropolitan Street Railway Company, of New York, proved. This thief had more nerve than wisdom and it led to his fall. One morning during the early hours he went to one of the conduit lines not yet in operation and with a saw cut out a copper feeder cable between two manholes, and carried it away before the eyes of a policeman who thought him an employe of the company. This success led him to return a few days later; but this time the wire was carrying current and the sparks from the contact of the wire and saw ignited the gas in the manhole, causing an explosion. The battered up thief was captured and held under \$500 bail.

Just what the night crew at the power station should do when an alarm comes in, we will not undertake to determine; but would suggest that shot guns have been found quite reliable in announcing the presence of a posse, and that if it were known that such persuasive voices would be heard, there might be fewer occasions for serenades of this character.

#### LADY PRESIDENT FOR THE SUTRO LINES.

The Sutro Railroad Company, of San Francisco, Cal., now has a woman for president. When Adolph Sutro was, some months since, found incapacitated for managing his affairs, his eldest daughter, Dr. Emma Merritt, was the choice of her five brothers and sisters for the guardian of the estate, which is estimated at over \$3,000,000. Mrs. Merritt was graduated from Vassar College in 1877; she afterwards came west and entered the medical department of the University of California, graduating in 1881. After her marriage to Dr. George W. Merritt, she and her husband went abroad and studied in European hospitals for three years. Mrs. Merritt is of a benevolent spirit, having



DR. EMMA MERRITT.

founded the Children's Hospital in San Francisco, and is considered an intelligent and conscientious physician. In order to properly manage her father's estate and preside over the affairs of the road, having been elected president last week by the directors, she has abandoned her medical practice. The main reason why Mrs. Merritt was chosen for that position was because the Sutro estate owns a majority of the stock. She has, in the minds of the directors, proper qualifications for making a successful officer. In an interview with a REVIEW representative Mrs. Merritt said that she knew but little of the affairs of the Sutro Railroad Company, and not having managed an electric road before, she was not sure as to the success of her administration. Mr. Von Rhein, vice-president and since Mr. Sutro's retirement acting president of the Sutro Railroad Company, found that the road required more time than he could spare from his private business and at the meeting of the board tendered his resignation. The Sutro Railroad Company operates a splendidly equipped double track electric street railway between Central avenue and the Cliff House, a distance of about five miles. Mrs. Merritt's administration will be watched with a great deal of interest by the local community, not to mention those who have no confidence in the executive ability of womankind. We expect, however, a vigorous and successful administration.

The Twin City Rapid Transit Company has the contract to carry mail between Minneapolis and St. Paul and the branch offices in the cities. This business has become so great that at times in the day the pouches interfere with the regular traffic and the building of mail cars has been considered. Auditor Castle, of the postoffice department, has recommended that letter boxes be placed on all cars in the two cities.

## THE GLASGOW EXPERIMENT IN MUNICIPAL OWNERSHIP.

Extract from a Paper on Municipal Ownership and Operation of Street Railways in England by Robert P. Porter—The Facts Regarding This Much-Cited Enterprise—Some Misapprehensions Corrected.

Hon. Robert P. Porter, superintendent of the United States Census of 1880, read a paper before the Massachusetts Committee on the Relations of Street Railways to Municipal Corporations, giving his views on the results of the municipal ownership of street railways in Great Britain. A full abstract of this paper has been printed as "Appendix E" of the Committee's Report, and from it we take that portion dealing with the city of Glasgow, lack of space preventing us from giving the whole of Mr. Porter's admirable paper, which was entitled: "Statement in Relation to Municipal Ownership and Operation of Street Railways in England."

Comparisons are made of the street railway systems of Chicago, of Philadelphia, of Boston and of Brooklyn, with those of Glasgow, of Birmingham, of Liverpool and of Manchester, as though there was some similarity or some common point where-in the systems of transit in these cities were comparable. In the same way the deadly parallel has of late been frequently drawn between American cities, and continental cities, with an utter disregard of the entirely different conditions. If those who have filled our library shelves with dissertations on municipal matters had expended half the energy in studying, from a broad and practical standpoint, the development of the up-to-date street railway system of Chicago, with a total mileage actually exceeding that of the United Kingdom, which they have devoted to the "Common Good Fund"\* experiment of three years in horse cars, on 77 miles of track in the city of Glasgow, they might perhaps have discovered some useful testimony. If the ability of these writers had been exercised in perfecting a system of municipal ownership for the network of street railways now under one management, and known as the Consolidated Traction Company of New Jersey, which runs through thirteen different municipalities of New Jersey, each with its own peculiar conditions, we should be in possession of far more useful data as to how municipal operation can be made practical, and the public best served under such conditions, than is afforded in a volume on the disastrous experiences of the town of Huddersfield in municipal ownership and operation of 22 miles of badly managed tramways.

To change the field of inquiry farther west, we have an opportunity to study the marvellously well conceived, equipped and managed street railway undertaking which connects the twin cities of St. Paul and Minneapolis, and brings not only the population of these two important cities together, but furnishes the inhabitants of each an almost perfect rapid transit for a cost lower than that ever attempted in any European territory, of equal area, even though American enterprise pays more than double the rate of wages for its labor. In such a study it might be well to look over a plan of both the Boston and Brooklyn street railway systems, and ascertain exactly what these great enterprises have accomplished for populations numbering respect-

ively 700,000 and 900,000. It has been truly said there is no possible way of ascertaining the average ride of Brooklyn or Boston street railway passengers, but the large areas covered by these cities, and the location of their residence districts at considerable distance from the business centers, make it certain that the average cost of riding is less than the cost of similar service in European cities. In New York we have practically three systems of rapid transit, and, in spite of continued demands for additional methods of transit, the people of the metropolis are taken to and from their homes and from point to point in the city much more rapidly than in either London, Berlin, Vienna or St. Petersburg, and at a lower cost. The bulk of the London traffic goes by omnibus, or over 326,000,000 passengers annually. The tramways carry about 225,000,000 passengers and probably the Underground 200,000,000. It is doubtful if as many people use rapid transit annually in London as in New York, as now constituted. Yet London contains 2,000,000 more population. The reason is that New York is more satisfactorily supplied with the means of rapid transit. The London field should yield 1,000,000,000 passengers annually, and would, if the right system of handling the traffic were adopted. In New York one-third of the passengers last year on one of the surface road systems travelled on transfers, and, as a result, the average fare was reduced to about three and three-fourths cents. The Metropolitan Street Railway Company and the Metropolitan Traction Company, which together form one of the three great systems of transportation of New York before consolidation, paid in 1896, in state and city taxes, rentals, licenses, mileage, etc., nearly \$600,000. Philadelphia has an excellent system of street railways, and one that is not at this moment yielding great profit to those who have brought the innumerable small companies under one management. Between 1891 and 1896 this company paved 271 miles of street from curb to curb, at a cost of \$9,000,000, while the company itself claims to have expended \$14,000,000. The paying dividend tax and car tax, together with the taxes on real estate, are equivalent to a revenue of from \$650,000 to \$700,000 to the city. The history and present condition of the street railway system of Philadelphia has been the subject of an interesting historical and economic study,\* and the conclusions reached by an apparently impartial and capable investigator are that the policy of "manipulating the political machine," which forms, as a rule, the burden of attacks on American street railway corporations, has been abandoned, "and Philadelphia is thus one step nearer the realization of the hope that Mr. Bryce expressed in her behalf after describing her imposing city hall,—that 'the officials who reign in this municipal palace will be worthy of so superb a dwelling and of the city where the Declaration of Independence and the Federal Constitution first saw the light.'"

In St. Louis may likewise be found one of the best equipped street railway systems in the world, giving a good service, carrying passengers, by the aid of transfers, fifteen miles for five cents, and at the same time contributing liberally to the municipality for the lease of its franchise. These are merely some of our larger systems, all, however, the result of recent consolidations, and made possible by the remarkable advance we have made in increasing the efficiency and reducing the cost of motive power. Of course the primary cost of such extensive operations has been enormous, partly by reason of the rapid and successive changes in equipment, partly because of the immense cost in the purchase of small companies, and partly because experiments to perfect the art of rapid transit are costly. The capitalization of these properties is undoubtedly in many cases high, and perhaps the speculative features too great. This, however, will adjust itself in time. The pluck, the courage, the enterprise, the ingenuity which have evolved these magnificent

\*Glasgow Corporation Tramways.—Common Good.—What It Is.—The property and revenues of the Corporation which are not held under special Acts of Parliament nor raised by taxation are known as the Common Good. It is the ancient corporate estate of the Burgesses of the City and Royal Burgh of Glasgow. The lands and property forming the capital of the Common Good were originally gifted to the city under certain burdens, or were purchased by the municipal rulers of the sixteenth century onwards from the proceeds of the imposts charged on all meat and drink entering the city. These proceeds were chiefly invested in land, and to-day a large portion of the revenue of the Common Good consists of feu-duties on the ground originally acquired in this way. The Common Good, although now but a small concern as compared with some of the other undertakings under the charge of the Town Council, performs many important duties. It watches over the interests of the citizens in regard to legislation. It acts as nursing mother to all municipal schemes in their initial stages, by advancing expenses and performing other parental duties until its offspring is able to stand alone. It now consists of the Bazaar, City Hall, St. Andrew's Hall, Old Clothes Market, Bird and Dog Market, Land at Coplawhill, Feus in Gorbals and other parts of the city, Blackhill Lands, the Tramway Undertaking, and other minor items. The net free capital amounts to £363,661 14s 10d (\$1,769,759.86).

\*John Hopkins University Studies in Historical and Political Science. "The Street Railway System of Philadelphia, Its History and Present Condition." By F. W. Speirs.



systems, are both admirable and American. In no other country can be found anything equal to these American enterprises; and, although the investment of \$1,500,000,000 which they represent may look large, the possibilities ahead are ample to make them safe as population expands and receipts increase. To assume for one instant that the same result could have been attained in any other manner is to ignore the facts within the reach of every American citizen. When compared with these results, what have we in Europe?

In glancing at European experiences in street railways, let us first ascertain what has been accomplished by municipal ownership and operation, because so much has been made by writers on this subject in the United States of these experiments. Attention may first be called to the city of Glasgow, because, though a comparatively recent experiment, it is generally conceded to be the most satisfactory. Huddersfield is in reality the oldest British experiment in municipal operation, but the results in that town have been so unsatisfactory that the subject presents but few attractions, and is, as a rule, dismissed with a general tribute to municipal ownership, but with no particulars. Glasgow, however, is different. The facts about Glasgow have been published in great detail, and the three annual reports which bring the operations down to May 31, 1897, are familiar reading to those interested in the subject of municipal ownership. Yet, with all this data before us, there are two distinct views of the municipally operated street railways of Glasgow.

First, we have the view of the advocates of municipal operation, who see in this experiment a great victory for their theory, and who argue that the facts warrant the immediate absorption of such undertakings by American municipalities. Indeed, these advocates go much further than the capable gentleman upon whom devolves the responsibility of conducting the enterprise in Glasgow. The story runs something in this way: After suffering the exactions of a private company for twenty-three years, the Corporation of Glasgow, finding it could not make a satisfactory arrangement or a renewal of the lease with the company, decided, upon the day the lease expired, to equip and operate the tramways itself. To this end it built new and handsome cars, bought a stud of horses, secured ground, buildings and machinery, and, in accordance with the program, put the street railway in operation. This was in July, 1894. Since then traffic has almost doubled, receipts have largely increased, fares have been reduced about half, wages of employes advanced, hours of labor reduced, and a largely enhanced revenue paid the city. Here is a tale familiar to those who read "municipal reform" literature.

The real facts about Glasgow, while indicating that the city has shown commendable enterprise in dealing with a difficult situation unexpectedly thrust upon it, are not of the slightest value to the United States, either as illustrating street railway enterprise or sagacity, or the ability of a municipality to operate such undertakings. On the contrary, a study of the Glasgow management of its tramways is one of the clearest exemplifications on record of the incapacity of a city to deal as thoroughly with such undertakings as private enterprises. I mean, of course, from the stand-point of an American city. When the advocates of municipal ownership propose to transplant the idea from abroad, and rest their case purely on foreign experiments, they must submit to a scrutinizing cross-examination of their principal witness, and not rest the case on a general statement, which, even though technically correct, is in fact absolutely misleading, because of the vastly differing environments. Thus, when these gentlemen announce that Sheffield, a town of 347,278 inhabitants, and Plymouth, a town of nearly 100,000 inhabitants, have, by act of Parliament, taken over their street railways, and that the respective municipalities propose to operate them hereafter, the statement is extremely misleading to the American mind, for this reason: towns of the size of Sheffield with us have in the neighborhood of 200 or 300 miles of track, while places of the size of Plymouth can generally boast of from 75 to 100 miles of street car lines. No one would suppose that the first undertaking means the acquirement, at the expiration of a lease, of 10 miles of worn-out track, most of which was sold as

old iron, together with a few very antiquated steam trams. Yet this is what Sheffield has actually done, and the transaction, including horses, cars, engines, buildings and plants, involved about \$130,000. Nor in the case of Plymouth would the ordinary American mind realize that the statement as respects that flourishing town of 100,000 inhabitants meant the payment of a few thousand pounds to a company of London speculators, who, after securing a franchise to put down tracks and actually tearing up one important thoroughfare, failed to fulfil the contract, and literally compelled the city to complete a portion of the line. Here we have two actual cases in which a bare fact without explanation becomes so nearly a falsehood that it is difficult to define the difference.

In the same way, the extracts from the reports of the Glasgow municipal street railway experiment are just as misleading, when published without proper explanations, and for the purpose of showing a greater capacity for dealing with such problems in Glasgow than exists in cities of a similar grade in the United States. What, then, is the real history of the Glasgow experiment, and wherein may be found its lesson? To understand the Glasgow situation fully, it is necessary to go back to 1872, when the first lines were leased to the Glasgow Tramway & Omnibus Company. These lines were laid by the city, at the expense of the city, and were leased to the company. The total capital expenditure of municipal money on these lines from 1872 down to July 1, 1894, when the city installed its own plant, was \$1,678,776.63. Of this amount, the company paid the city during its twenty-three years' lease, \$980,454.09 towards the cost of construction of the lines, reducing the capital by that amount and enabling the city to enter into possession of a property which cost \$1,678,776.63 at a nominal cost of \$698,322.54. So carefully is this fact guarded in the official reports quoted by municipal ownership advocates that it has never been referred to in any statement of the so-called profits accruing to this undertaking. This item of nearly \$1,000,000 I find entirely omitted from the capital account, and only the sum of £143,495, 16s., 11d. (\$698,322.54) charged up. In addition to this payment of nearly \$1,000,000, the city received as revenue during the twenty-three years of the lease \$1,169,125.28, in name of interest on capital expenditure, and \$223,823.38 as mileage rate, while the sum expended by the corporation for interest on current tramway debt and on sinking fund was \$1,083,302.74; leaving a balance of \$309,645.92, or an annual average during the whole of this time of \$13,462.86, as the mileage rate and profits of the corporation. The advocates of municipal operation have a way of putting this \$13,462.86 against the \$43,798.50 now paid annually to the Common Good Fund, forgetting to add that the average payment runs back to the time when the city had only \$16,867.28 invested in track, and that it steadily increased until for the last thirteen months of the lease it reached \$32,109.16. This would indicate that, with ordinary business foresight, the private company would have been able to pay Common Good Fund at this time even greater revenue. The facts certainly do not warrant the comparison with the average of the twenty-three years of the lease, which is the way it is generally given the American public.

On the first day of July, 1894, the municipality of Glasgow found itself in possession of about 65 miles of single track, which had originally cost the city \$1,678,772.17, but on which \$980,454.09 had been paid by the old company, in addition to the net profit of \$309,645.92 for the Common Good. What would an American city have done under like conditions? Leased the right to a private company to install a first-class electric plant, extending the mileage to 200 or 300 miles of track, for this Glasgow system serves a population of 800,000. This company would have paid the city a good mileage rate for the track, and a much larger sum to the Common Good Fund, together making, for the privilege of carrying 100,000,000 passengers, a sum far greater than that the Glasgow corporation will ever make for the city out of its enterprise. Of more value than all this to the community would have been the service, which would have taken the people into the small suburban places around the city, and, by the aid of low fares for long distances, given them

the benefit of comfortable and cheap homes. What has Glasgow done? With a capital account which May 31, 1897, aggregated \$3,065,741.32, without counting the \$980,000 paid back to the city construction account by the old company, which really represents \$4,046,195.41, Glasgow has, in the latter half of 1894, installed a system of horse cars. In so doing, she has purchased new horses, new cars, bought the ground, built new barns, and in fact, purchased an entire equipment. Naturally, the business-like American asks the question, Why did Glasgow commit this act of folly? And the answer comes promptly, Because the Town Committee of twenty-five members could not agree on a system of mechanical motor. Under like conditions on this side of the Atlantic there would have been a dozen enterprising American firms, ready with bonds to any amount, to take the whole responsibility, and give the people a good service and pay the city a liberal revenue. Yet we are seriously told, by earnest gentlemen, that in the management of rapid transit we have much to learn by studying the situation in Glasgow.

The municipality of Glasgow therefore has in fact upward of \$1,000,000 invested in 77 miles of horse railways and the equipment therefor. It will be noted that the track mileage has not been greatly increased, as it was 31 miles 3 furlongs of double track in 1894, when the city took the roads, and only 32 miles 2 furlongs May 31, this year, when the last report was made. If an enterprising private American firm could not have made more out of this opportunity, both for the corporation of Glasgow and the company, it would indeed be strange.

And now a word in relation to the revenue of this system. The total revenue for the fiscal year of 1897 was \$1,804,897.25. Of this amount \$1,393,210.81 was paid out for working expenses, of which about \$632,000 was paid direct for salaries and wages. The wages paid in Glasgow are a trifle less than half the rates paid for similar employment in New York, and about half the rates paid in cities of the same size in the United States. A forcible illustration of the danger of making comparisons between the results achieved by these undertakings at home and abroad, especially in relation to cost of service, has recently been brought to my attention. Mr. John Young, manager of the Glasgow Corporation Tramways, sent me an official statement of the scale of wages paid employees, which is as follows:—

## GLASGOW CORPORATION TRAMWAYS, SCALE OF WAGES.

	Per day.
Point boys, .....	\$0.28
Horse turners, .....	.34
Trace boys:—	
First six months, .....	.40
Second six months, .....	.44
Thereafter, .....	.48
Horse keepers:—	
First six months, .....	.80
Second six months, .....	.82
Thereafter, .....	.84
(And 24 cents for Sunday morning duty.)	
Sick-horse keepers:	
First six months, .....	.84
Second six months, .....	.88
Thereafter, .....	.92
Car washers:—	
First six months, .....	.84
Second six months, .....	.88
Second year, .....	.92
Thereafter, .....	.96
Drivers and conductors:—	
First six months, .....	.92
Second six months, .....	.96
Second year, .....	1.00
Third year, .....	1.04
Thereafter, .....	1.08

The above rates apply equally to Sundays and week-days.

JOHN YOUNG, General Manager.

Wishing to compare this with the rate of wages paid persons

similarly employed in the United States, the above table was sent to President Vreeland, of the Metropolitan Street Railway Company of New York, with request to furnish similar information for the United States. In reply the following table was prepared:—

## METROPOLITAN STREET RAILWAY COMPANY OF NEW YORK, SCALE OF WAGES.

	Per day.
Point boys or switch boys, .....	\$1.00 to \$1.25
Horse turners or changers, .....	None
Trace boys or tow boys, .....	\$1.00
Horse keepers or hostlers, .....	1.75
Sick keepers or hospital men, .....	1.75
Car washers, .....	1.50
Horse-car drivers, .....	2.00
Horse-car conductors, .....	2.00
Cable gripmen:—	
First year, .....	2.25
Thereafter, .....	2.40
Cable conductors:—	
First year, .....	2.00
Thereafter, .....	2.25
Motor men, electric:—	
First year, .....	2.25
Thereafter, .....	2.40
Electric car conductors:—	
First year, .....	2.00
Thereafter, .....	2.25

H. H. VREELAND, President.

An examination of the rates paid in Glasgow and in New York shows that in every case the American rate of wages is more than double.\*

Deducting the \$1,393,210.81 from the total revenue of \$1,804,897.25, we have \$441,686.44 for rent of one small line, interest on capital, sinking fund, depreciation, written off capital, permanent way renewal fund, the \$43,798.50 payment to the Common Good Fund, and for a general reserve fund. I have shown that nearly \$1,000,000 of the original cost of constructing the track by the city had been wiped out by the private company prior to 1894, so the undertaking is thus, even at the low rate of 2½ per cent interest, relieved of \$24,332.50 per annum, which reduces its interest account to \$67,326.75. A private company, with a capital of \$4,046,195.41, would probably have to pay 4 per cent, or \$161,847.81 per annum interest, instead of \$67,326.75, which is an important saving. The Glasgow Corporation shows hard Scotch sense in writing off \$65,747.30 for depreciation of plant; in setting aside, as it did in 1897, \$72,997.50 for permanent way renewal fund; and in setting aside the remainder for general purposes. A careful examination of these accounts does not indicate that the sums thus set aside are any too great, when we remember that much of the track has been in use for many years, and that constant repairs are necessary. There is, however, another contingency that will surely soon arise, as it is already under serious consideration, namely, an entire change of equipment from horse to mechanical equipment. Under the

\*In this connection the rates of wages paid by the West End Railway Company of Boston may be of interest. The following table has been sent me in response to a request to the officers of that company.

## WEST END STREET RAILWAY COMPANY, SCALE OF WAGES.

Chief inspectors, .....	\$2.75 per day
Inspectors, .....	2.50 " "
Starters, .....	\$2.00, \$2.15 and 2.50 " "
Receivers, .....	\$2.50 and 2.75 " "
Conductors, .....	2.25 " "
Motormen and drivers, .....	2.25 " "
Checkmen, .....	\$2.60 and 2.25 " "
Shifters, .....	\$1.50, \$1.75 and 2.00 " "
Car cleaners, .....	1.50 and 1.75 " "
Watchmen, .....	\$1.75 and 2.00 " "
Switchmen, .....	11.00 " week
Sandmen, .....	11.00 " "
Feeders, .....	1.50 " day
Hostlers, .....	1.50 " "
Harness cleaners, .....	1.50 " "
Tow boys, .....	9.00 " week
Flagmen, .....	2.25 " day



present act, the Glasgow Tramway has still left and unused borrowing powers of \$781,686.42, which may be utilized for such a purpose; but when that is exhausted the city will have really in the neighborhood of \$5,000,000 invested in a railway system of 32 miles of double track. This, however, is for future consideration; for the present the 800,000 or more people served seem contented with the present track and with horse cars. However the Glasgow experiment may be regarded in Europe, in the United States the Glasgow system cannot be regarded as satisfactory; and a city having such an opportunity, and throwing it away, as Glasgow has done, would be regarded as the man in the parable, who buried his talent in the ground.

A further examination and comparison of the revenue reports of 1896 and 1897 shows that, though the revenue in 1897 was \$177,651.98 in excess of 1896, the working expenses, increasing from \$1,222,026.31 to \$1,393,210.81, practically used up the increased earnings; the amount set aside for interest, depreciation, reserve fund, etc., only showing an increase from \$405,218.85 in 1896 to \$411,686.43 in 1897.

A striking feature of the examination of the accounts of the Glasgow Municipal Tramway experiment, with a view of comparing it with similar undertakings in the United States, is the fact that the actual figures show that, had the same wages been paid labor as in the United States, the total paid out for the year 1897, instead of being about \$632,000, would have exceeded \$1,264,000, making the working expenses exceed the total revenue of the road by \$220,313.56, and left the whole system in a hopeless condition of bankruptcy.

The true history of the Glasgow street railway enterprise certainly indicates that the initiation, in the summer of 1894, of a horse street railway was a mistake, from the American point of view; that the extension of track has been inadequate; that the payment of wages is less than half the sum paid in the United States; and that general expenses are apparently increasing at a greater rate than revenue from traffic. Nor do the figures show that the city is any better off to-day than it would have been under a good lease with a reliable enterprising company, willing to spend the necessary capital to install a modern street railway plant, with mechanical motor and adequate mileage. The old company, bad as it was,—and all companies naturally lack enterprise during the last few years of a lease with little hope of renewal,—wiped out in twenty-three years nearly \$1,000,000 of the cost of construction for the city, which went to the good of the municipal enterprise, but which could have been the source of \$25,000 or \$30,000 clear revenue from a private corporation. The same company contributed \$309,645.92 to the mileage and Common Good Fund. These are all important factors in the problem under consideration, and must be properly accounted for before comparisons of the two systems can be safely and fairly made.

The only question which now remains to be considered is the question of fares. Have the fares been materially reduced? Fortunately, on this point, as on all others, I have a direct statement from Mr. John Young, the capable manager of the Glasgow City Tramways, which he sent me under date of August 9, 1897. Here it is:—

**FARES AND DISTANCES UNDER GLASGOW TRAMWAY & OMNIBUS COMPANY, PREVIOUS TO 1ST JULY, 1894.**

Fare.	Average Distances.
½d. (1 cent),	None.
1d. (2 cents),	.1.12 miles.
1½d. (3 cents),	.1.80 miles.
2d. (4 cents),	.2.20 miles.
2½d. (5 cents),	None.
3d. (6 cents),	.3.23 miles.

**UNDER GLASGOW CORPORATION.**

Fare.	Average Distances.
½d. (1 cent),	.58 miles.
1d. (2 cents),	.1.75 miles.
1½d. (3 cents),	.2.33 miles.
2d. (4 cents),	.3.47 miles.
2½d. (5 cents),	.4.18 miles.
3d. (6 cents),	.5.34 miles.

Mr. Young, as will be seen, has created a halfpenny fare for those who want to ride half a mile, and has increased slightly the distances for the other rates of fare. Mr. Young himself lays great stress on the boon of a halfpenny fare. I fail to see any great advantage in it, except for people in the city districts. As a matter of fact, one can walk half a mile about as quickly as he can wait for these horse trams, which jog along slowly and pull up at each corner. The moment, however, he reaches four miles, or a distance that will take a man from the crowded city to the suburbs, where houses are more plentiful, air better and rents cheaper, the price goes up to two pence halfpenny, or five cents. Much has been done in the way of improvement in various parts of Scotland; but, according to the census of 1891, twenty-two per cent of Scottish families still dwell in a single room each, and the proportion in the case of Glasgow rises to thirty-three per cent. Altogether there are in Glasgow over 120,000 and in all Scotland 560,000 persons (more than one-eighth of the whole population) who do not know the decency of even a two-roomed home. Compare with this phase of Scottish working-class life the fact lately revealed by an elaborate inquiry into the dwelling-houses of our own city of Boston, where rents are high. The number of families dwelling in single rooms was found to be only 1,053, or less than one and one-half per cent, as against Glasgow's thirty-three per cent. It would be difficult to say to what extent a good street railway system would change that condition, though we must realize that the several hundred miles of track have had much to do with spreading population and building up suburban districts.

The average fare last year on the Metropolitan Street Railway was about three and three-quarters cents per passenger, after taking into account the transfers. This sum would not carry you much over an average of three miles in Glasgow. In New York, in Brooklyn and in Boston you can ride a distance of ten or even fifteen miles in almost any direction for five cents. The Glasgow system would simply be impossible in any of these cities, with its six different colored tickets and variegated distances. It may suit the conditions in Scotland, but it would not suit our conditions here. Moreover, it is against all sound principles of rapid transit, which on this side the Atlantic aim to get the people as far out of the city as possible, thus creating business for the street railways, and homes and values for the people. The European system, and especially the British system, seems to be to jog lazily around the cities, pick up the pennies for short distances, and charge such a high rate for the long haul that no public demand is made to extend street railways into districts that may prove unprofitable to the enterprises,—or perhaps I should say undertakings, for there is little enterprise about the British tramway.

While some municipal ownership advocates are eulogizing the system just described, the more advanced undertakings in England are adopting the American plan. Thus the elevated traction of Liverpool has adopted a uniform fare, six cents first class and four cents second class. The Glasgow District Subway, a private enterprise opened since the city has had control of the surface tramways, charges two cents for short distances and four cents all around the city. The London Central Underground Railway I believe has also decided upon a uniform fare of six and eight cents, according to class. This is a wise decision, because the people who ride in the daytime on business can either afford to pay, or, if they cannot, in a majority of cases are furnished by their employers with car fare. It is of much greater importance to afford facilities to those who live on outskirts to enjoy the advantages of better air and cheaper rents. In other places a uniform fare is talked of, but the transfer system has not, so far as my observation extended, been introduced. The facts in the Glasgow case warrant the conclusion that a wide-awake American street car company could have leased the Glasgow tracks when the city took them over, installed a modern system, extended the track, and, with the Glasgow wages, just half those paid at home, carried passengers as cheap, if not more cheaply, than Glasgow is carrying them to-day. It could, furthermore, have assumed all the risk, and paid the city more money per annum, with profit for mileage and Common Good, than it will get by operating the cars itself. If the facts do not indicate

this, those who differ may have a chance to point out wherein these are not reasonable conclusions from the data examined. At any rate, I have been informed of one American syndicate offering to install a mechanical system in Glasgow, and, if granted a reasonable lease, guarantee the Common Good Fund a net income of £50,000 (\$243,325) per annum, the city to assume no risks. This offer may be open at the present time.\* However this may be, the actual results in Glasgow, when put to the American test, in no way indicate that the Glasgow experiment has either solved a problem in street car enterprises, nor is it of the slightest value in pointing out a civic moral, or adorning a municipal ownership tale.

\*It will be noted that Glasgow, at the time of my visit in August, had invested \$4,047,195.41 in its entire street tram car system, including 77 miles of track. In the report of Mr. F. S. Pearson, engineer of the Metropolitan Railway Company of New York, to the city of Liverpool, this well-known authority on mechanical traction estimates (page 48) the cost of equipping with the overhead trolley system 70 miles of single track, with 300 cars and complete equipment, at £911,000 (\$4,433,381.50). Had this course been adopted in 1894, instead of the installation of a horse system, the city of Glasgow would have saved several millions of dollars, and would now have a modern street car system, instead of facing, as the managers are, the problem of installing a new equipment. The detail of this estimate was as follows:—

ESTIMATE OF COST OF EQUIPPING WITH OVERHEAD TROLLEY SYSTEM.

(Seventy Miles of Single Track; Three Hundred Cars and Equipment):

Seventy miles of track, at \$28,469.02 .....	\$1,992,831.75	
Special track work .....	121,662.50	
Extra expense on twenty miles in city district .....	19,466.00	
		\$2,131,927.00
Feeder system, .....	\$ 170,327.50	
Transformers, .....	58,738.00	
Transformer stations, .....	24,332.50	
		253,058.00
Car houses, .....	\$ 194,000.00	
Shops, .....	97,330.00	
		291,900.00
Cars and equipment, 300, at \$2,676.57 .....	\$ 802,972.50	
Snow equipment, .....	29,199.00	
		\$32,171.50
Power station, .....	924,635.00	
		\$4,433,381.50

**BICYCLE BAGGAGE CARS.**

The Long Island Railroad Company was early in the field to cater to the bicycle business and was the first to appoint an official whose duties included the care of the cycling public. In June, 1897, H. B. Fullerton was appointed special agent in the traffic manager's department, to look after the bicycle traffic. During last year 180,000 cyclists were carried; on July 3, between 1 and 4:30 p. m. over 4,000 wheels were checked from Long Island City alone. Mr. Fullerton writes us concerning the methods adopted to increase the business and care for the wheels in transit.

"Cyclists' Paradise," a little hand-book, was published, giving a good map showing the "good roads" and "fair roads" and the various cycle paths which abound on Long Island. It also gave suggestions for tours, routes to all points, hotels catering to the cycling public (and they are many), mileage to all points and extracts from the summer time table. An edition of 15,000 was used and on request was sent to all parts of the United States. It was found absolutely necessary to devise some means for handling wheels quickly and satisfactorily. After careful examination of the various appliances, the one illustrated was selected as best suited for the purpose.

Fig. 1 shows half-sections of round-top and monitor-top cars, and makes clear the manner of suspending the wheels, the positions of the hangers varying somewhat in the different styles of cars. Fig. 2 shows a plan of a 60-ft. baggage

car filled with wheels. The black lines show wheels in holders on the side of the car; the dotted lines those suspended from the roof. The clear passageway is 3 ft. 6 in. wide and the arrangement leaves spaces at all four doors. The number of wheels per car is 136; 68 on the sides and 68 overhead.

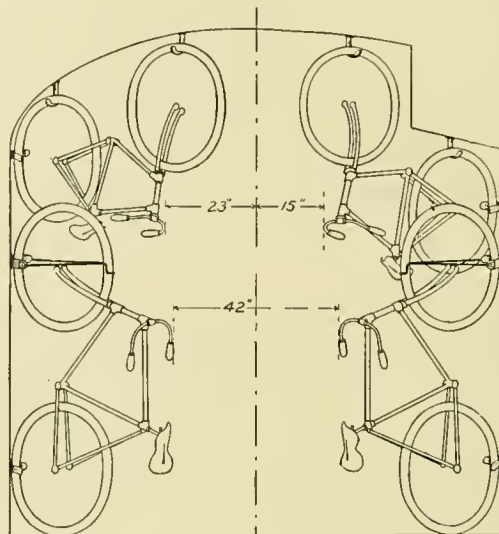


FIG. 1.

The Long Island road has six full-length baggage cars so equipped and they prove very satisfactory. The number of wheels per car is somewhat reduced but this method makes absolutely impossible any serious injury or even the scratching of enamel, something that could not be accom-



FIG. 2.

plished in the old method of stacking up wheels loosely in the car and piling others on top.

Besides these regular bicycle baggage cars the company equips its combination and other cars with overhead hooks which enable it to handle the normal week day traffic with ease.

**THE ELECTRICAL EXHIBITION.**

The Electrical Exhibition at Madison Square Garden was formally opened the evening of May 2, in the presence of fully 10,000 people. Dr. Chauncey M. Depew was the orator of the evening. After the oration, he read a message from President McKinley declaring the exhibition open. This was followed by a message from the vice-president.

At Los Angeles, Cal., a few weeks since, a young man attempted to blockade the street railway track and bring the cars to a standstill by a shot across the bow, to the great amusement of himself and companion. He had lots of fun till his ammunition gave out and then he was taken home to sober up. A complaint of assault filed against him was later dismissed.



**MINARY PRESIDENT OF LOUISVILLE RAILWAY.**

J. B. Speed, who for nine years has been president of the Louisville Railway Company, resigned that office on April 20, in order that he might devote more time to his other business affairs, and T. J. Minary was chosen as his successor.

T. J. Minary was born at Versailles, Ky., in 1850, and removed to Louisville in 1869. In 1872 he was chosen secretary of the Central Passenger Railway Company, and four years later was made general manager. In this position he displayed great executive ability and on the consolidation of the five companies into the Louisville Railway, owning and operating all the street railway lines in that city, he was chosen general manager of the new company, which position he has held ever since. He will continue to exercise the duties of general manager as well as those of president, and the recognition of his ability and services is alike gratifying to his street railway friends and the citizens of Louisville.



T. J. MINARY.

**NEW BRIDGE AT NIAGARA FALLS.**

The accompanying illustration shows the progress which has been made in the erection of the steel arch bridge to replace the suspension bridge connecting the New York State Reservation and the Queen Victoria Niagara Falls Park. The distance between the cliffs at this point is 1,268 ft.; the arch of the bridge is 868 ft. long and is connected to the cliffs by steel arms which are 210 ft. and 190 ft. long, respectively. The width of the bridge is 49 ft.; 23 ft. in the center is for a double trolley track. The engineer in charge, and the designer as well, is L. L. Buck, who designed the Grand Trunk bridge two miles down the river, and remodelled the suspension bridges at Niagara.

In constructing the abutments the loose dirt and rock of the debris slope were cleared away until solid rock was reached, and this cut away in step form. On this a foundation of concrete was built. The stones in the abutments weigh from 2 tons to 6 tons apiece. There are four abutments, two on each side of the river, the members of each

pair being 67 ft. apart and each supports one leg of the arch. The shoes of the arch are anchored by eight 3-in. bolts, four of which extend through the stonework into the concrete foundation.

The new arch occupies almost the exact site of the suspension bridge, the only change being to move the American end a little to the south in order to place the abutments clear of the portal of the Niagara Falls Power Company's tunnel. This arch will be the greatest of its class, as shown by the dimensions of other great arches given below:

	Span.	Rise
New Niagara Arch .....	868	150
Louis I, Oporto, Spain.....	566	146
Garabit, France.....	543	170
Pia Maria, Portugal.....	525	121
Eads' St. Louis Bridge.....	520	47
Washington Bridge, New York.....	510	92
Paderno, Italy.....	492	123
Rochester Driving Park .....	428	67
Grand Trunk Arch, Niagara.....	550	114

The rise of this arch is measured from the level of the piers at the skewbacks; the floor is 192 ft. above the water.

**ONE RESULT OF CONSOLIDATION.**

The secretary of the street car union at Detroit is reported as saying, and he says it with regret, that the consolidation of the Detroit Electric with the Detroit Citizens' road has reduced the membership in the local union from 1,200 to about 800. This is a natural result, since by the consolidation the operation of many parallel lines, for the building of which the traffic furnished no justification, was discontinued. The company is also accused of selfish motives in seeking to give the patrons rapid transit, as any decrease in the running time enables the same service to be given in with fewer cars and fewer employes.

**CONDUCTORS SWINDLED.**

A gang of "short change workers" has been operating in Chicago with success. Two or more of these men, well dressed and having the appearance of prosperous business men, will enter a car together. One will offer to pay the fares for himself and companions and present a \$5 bill to the conductor. An accomplice will attract the attention of the conductor and say a few words to him. The first man will then substitute a \$2 for the \$5 bill and hand it to the conductor who, having first plainly seen the \$5 bill and not noticing the difference, will return change for \$5. The scheme has been cleverly worked and the swindlers have escaped.

**LONDON STREET CARS SUPPLY CIGARETTES.**

The proposition has been made to place automatic machines for selling newspapers on street cars, but the experiment of distributing cigarettes in that manner has remained for the North Metropolitan Tramways Company, of London. Two cases are to be placed on each car, one at each end on the outside attached to the hand-rails. By inserting a penny in the slot two ordinary cigarettes will be delivered, or one of superior quality for the same coin. These machines are for the convenience of outside passengers only, as no smoking is allowed in the interior of the cars.

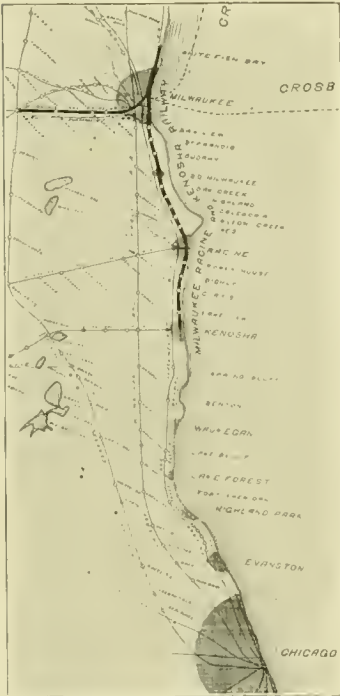


NEW NIAGARA BRIDGE.

### THE MILWAUKEE, RACINE & KENOSHA.

The Milwaukee, Racine & Kenosha Electric Railway Company was organized in August, 1896, with a capital stock of \$250,000, having for its object the building of interurban railways which together with the tracks of the Racine and Milwaukee companies would give a through line from Milwaukee to Kenosha. Work was commenced the following month on the northern section of the line and the first car started January 1, 1897; construction work was pushed on the Kenosha end as rapidly as franchises and right of way could be secured, and this portion of the line was opened in November, 1897.

The company encountered opposition from the Chicago & Northwestern Railway which objected to having its line crossed at grade; after testing their respective rights in the courts the matters in dispute were settled amicably and two subways built under the railroad between Racine and South Milwaukee to avoid crossings at grade. All parties now congratulate themselves on the final outcome. On the southern end of the line two grade crossings with the railroad were avoided by the electric company purchasing its own right of way and not following the highway where the latter crossed and ran on the west side of the railroad. The road there-



fore has not a single railroad crossing excepting that of a spur from the C. & N. W. which runs down to the lake shore and is used for taking out sand only; this of course requires no gates or flagmen.

From Milwaukee to South Milwaukee, 10 miles, the tracks of the Milwaukee Electric Railway & Light Company are used, and in Racine the Belle City Street Railway Company's tracks are used for a distance of 2.9 miles. From the northern limits of Racine to South Milwaukee, 14 miles, and from the southern limits of Racine to the northern limits of Kenosha, 10 miles, the company built its own track; it is expected that a franchise in Kenosha will be secured and the line extended to the heart of the city during the summer. On the southern end of the line the route is quite close to the lake shore, one-third being over a private right of way and a double track line. This portion of the road is nearly free from grades and curves, the worst grades being at the crossing of Pike creek; an iron bridge of 25 ft. span supported on stone abutments was built here. The northern end of the road has many grades and curves; the company has, however, determined to better these conditions as rapidly as it can do so, and will straighten curves and cut down the grades as funds are available for that purpose.

The line is laid with 56-lb. T-rails on ties 6 x 8 in. x 8 ft., spaced 2 ft. between centers; cedar ties are used on straight track and oak ties on curves and at switches. The joints are fished with 4-hole extra heavy angle plates. Atkinson "horseshoe" bonds are used on the north end and Washburn & Moen bonds on the south end of the road. All of the northern section is ballasted with crushed stone, and the work of similarly ballasting the south section is in progress; some 16,000 cu. yds. of stone have been used up to the present time. At the turnouts spring switches furnished by the Cleveland Frog & Crossing Company are used.

The overhead work is carried on a single line of side poles with brackets where the route is in the highway, the track being along the side of the road; and the double pole suspension is used on the private right of way. The poles have 6 in. tops, are 35 ft. long and are spaced 120 ft. apart. From Racine to South Milwaukee there are double trolley wires, No. 00, and from Racine to Kenosha one trolley wire, No. 0000. From Racine north there are two No. 0000 feeders, one 10 miles long and one 7 miles long; from Racine south are two of the same size, one extending the whole distance and the other about two-thirds. Washburn & Moen supplied the wire, and the Ohio Brass Company the brackets, hangers, ears, etc.

On the tracks of the Milwaukee Company that company furnishes the power; a booster was put on this line about 6 weeks ago. On the remainder of the line power is furnished by the Belle City Street Railway, of Racine, and paid for on a car-mile basis.

The rates of fare are: Kenosha to Racine, 20 cents one way, 30 cents for round trip; Racine to South Milwaukee, 30 cents one way, 50 cents for the round trip; from South Milwaukee to the city limits of Milwaukee a 5-cent fare, and from the city limits to the City Hall a second 5-cent fare, is charged, the last two being collected separately and rung up on a register of the Milwaukee Company. When on its own tracks fares are rung up on "International" registers. These rates are just one-half those charged by the steam roads, and were so effectual in withdrawing patronage from the latter, that the Chicago & Northwestern took off its interurban trains between Racine and Milwaukee after the electric road had been in operation for four months.

The map clearly shows the general location of the road. There are no towns other than Kenosha with a population of 10,000; Racine with 30,000, and South Milwaukee and Milwaukee. The intermediate stations, which have received



SQUARE IN RACINE.



names for convenience, are at the switches and turnouts, and are called stations in order to assist in distributing the fares for intermediate distances; the rate between any two consecutive stations is 5 cents. It may be remarked that the question of intermediate fares has been a troublesome one from the fact that the occupants of contiguous farms may in some instances find that one has two fares to pay for a ride which is but little longer than that for which the other pays a single fare.

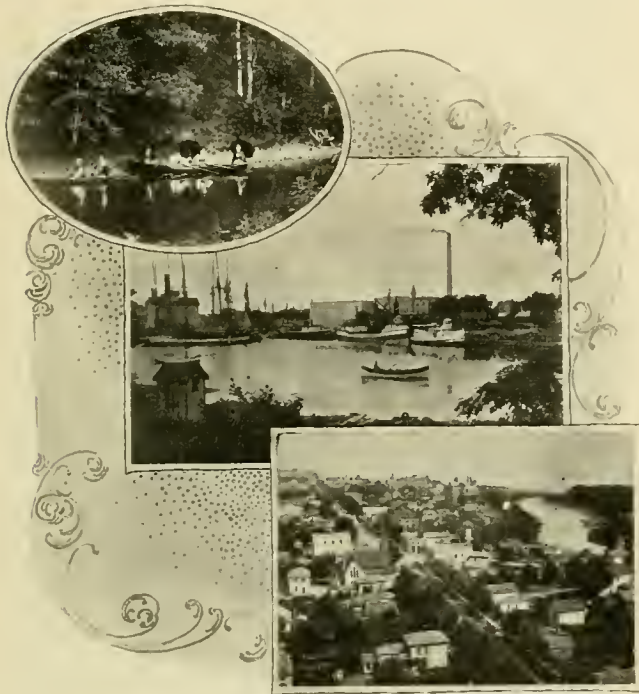
The trains receive orders by telephone, Andrae telephones being installed, there being booths at the several turnouts or stations; the conductors report only on arriving at South

beginning with the "Ms," Maryland, Massachusetts, Michigan, etc., which names are pleasing to the ear and remind one of the battleships, which we remote from the coast may perhaps imagine cars to resemble in size. One of the new cars, the Maine, is to have a compartment for baggage and express, otherwise it is of the same dimensions as the others. In connection with the car equipment of the road, the Rodgers ballast car, built by the Wells & French Company, Chicago, should be mentioned; Superintendent Nelson states that it is the best investment on the road.

The company has recently built a car barn at the south end of Racine, which is of brick, 51x100 ft., and divided into two parts by a fire wall. There are three tracks, with pits, extending the length of the barn. A lot 600 ft. square was purchased at this point and the offices are shortly to be moved out to the barn, leaving a ticket office and waiting room only in the city.

A short distance below Racine it was necessary to lay a 20-in. sewer along the track for a mile or more to carry off the surface water; this is an expense not usually incident to street railway construction.

The line from Racine to Kenosha is in view of the lake the entire distance, the greater part of the way quite close to the shore, and in summer offers as pretty a prospect as one need desire. There are several points on the line, notably Curtis' Grove and Jacob's Island, the latter, some 20



IN AND NEAR KENOSHA.

Milwaukee, however, if on time; if the car is off its regular time the conductor reports to the office for orders at the intermediate telephones as well.

The company now has nine passenger cars and three more are building; they are all of the same dimensions, 37 ft. over all with seats for 42 persons. They are provided with closets and heated with the Baker hot water system. Card tables are also carried and placed at the disposal of parties desiring to use them.

A controller is placed in the front end only and the cars are turned at the ends of the route; a Y is provided at the Kenosha terminus for this purpose. Six of the cars are mounted on maximum traction trucks, and equipped with two 50-h. p. Walker motors; two are mounted on Peckham No. 14 trucks, and one on Peckham No. 15 trucks. The Peckham trucks are equipped with Westinghouse 38B motors. No. 15 trucks and 38B motors will be placed under the cars now building.

The cars were originally a red color but are now being put through the shop and repainted a dark green, which gives them a handsome appearance, much more pleasing to the eye than the red. Rather a novel feature that has just been introduced is the naming instead of numbering the cars; they are hereafter to be known by the names of states,



SCENES ALONG THE LINE.

acres in area and well wooded, about a mile north of Kenosha, which are very suitable for pleasure resorts, and one or more of them will no doubt be developed in this direction in the near future. Last summer pleasure riding



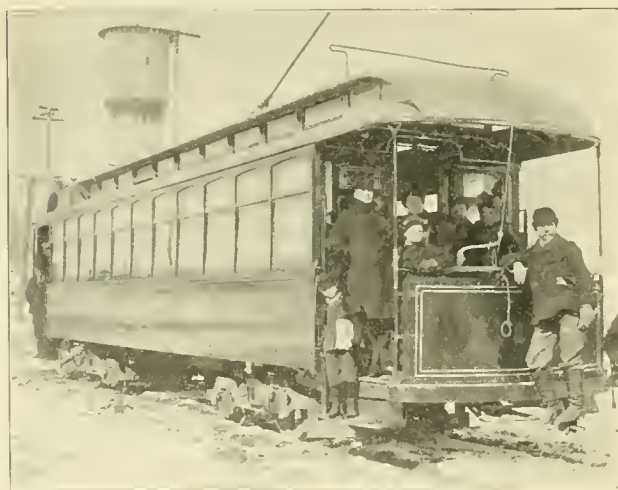
CURTIS' GROVE AND THE LAKE.

was a source of considerable revenue, and a park on the south end of the line would greatly stimulate this traffic.

The illustrations show Curtis' Grove, a view on Pike creek and scenes in Racine and Kenosha, which give one an idea of the attractiveness of the route.

The line between Kenosha and Milwaukee, from January 1, 1897, to January 1, 1898, carried 400,000 passengers; until July 15, 1897, the northern terminus was South Milwaukee. The receipts during the present year up to date indicate that the number of passengers carried will be fully twice as many as last year, and also that the south end of the line will be fully as busy as the north end. January, 1898, the receipts were two and one-half times as much as for January, 1897.

Cars leave the City Hall, Milwaukee, for Kenosha each hour, and for South Milwaukee every half-hour. In the winter the first car leaves at 7 a. m., in summer at 5 a. m., and the last at 11:20 p. m. Going south from Racine cars

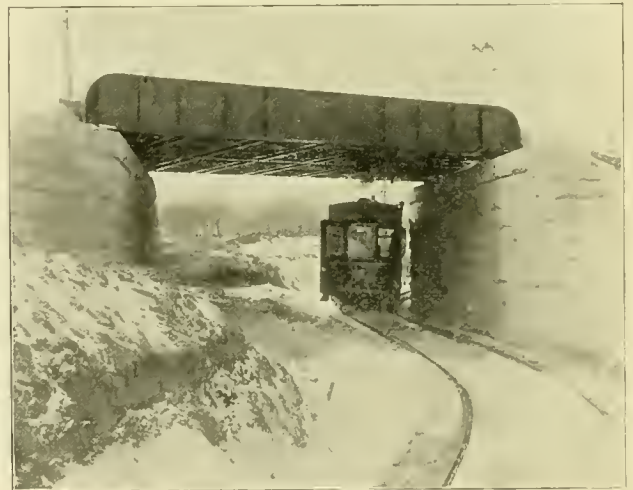


MILWAUKEE, RACINE &amp; KENOSHA CAR.

run every hour; in the morning the second car out starts 30 minutes after the first. When running a six-car schedule two cars are housed over night in Milwaukee, two at the barn of the Belle City road in Racine and two at the company's barn; by this arrangement the first north-bound car starts from the south end of Racine and the south-bound car from the north end, making it convenient for passengers to take the cars.

The projectors of the road were Matthew Slush and A. W. Bishop, and it was owing to their perseverance and hard work that the road was put through, and made the valuable property that it is. They are both old street railway men and have been identified with several similar enterprises, all of which they have brought to a successful issue.

The officers of the Milwaukee, Racine & Kenosha Electric Railway are: Matthew Slush, president; A. W. Bishop and William Grief, vice-presidents; G. J. Hoffman, secretary and treasurer; I. R. Nelson, superintendent; John Skelton, electrician. We are indebted to Mr. Nelson for



NO. 1 SUBWAY, CALEDONIA TOWNSHIP.

courtesies extended and for the photographs from which our illustrations were reproduced.

In connection with the Milwaukee, Racine & Kenosha line the much-discussed through line from Chicago to Milwaukee is of interest, since the former road covers nearly one-half the distance. From Chicago to North Evanston there is the Chicago North Shore Electric Railway. Between Evanston and Waukegan the Bluff City Electric Railway is now building, and already has two sections in operation; one of these is from Waukegan south to North Chicago, four miles, and the other from Fort Sheridan to Highland Park, three miles.

As previously mentioned, the building of a road through Kenosha in the near future is quite probable; this would leave a gap of only 16 miles in the through line, which will probably be built by one or both of the two interurbans, but there are no definite plans in regard to this section as yet.

The reorganization committee of the Metropolitan Elevated, Chicago, has not yet decided upon how the new securities will be issued; it is probable that a scheme will be adopted that will make the fixed charges as low as possible.



## INDIANA STREET RAILWAY STATISTICS.

The accompanying table gives the data for the street railways of Indiana for the fiscal year ending May 31, 1897, as reported to the Indiana Bureau of Statistics. The company at Kokomo has not as yet made a report. Of the 23 companies reporting, one is not operating the road, two (those at Vernon and Jeffersonville) use mules for motive power and the others are all electric roads.

During the year covered by the report no company reduced wages and one, the Ft. Wayne Consolidated, increased the rate for motormen and conductors 1 cent per hour.

In explanation of the large amount for damages in the case of the Citizens, of Indianapolis, it should be stated that this includes legal and court expenses.

## BROOKLYN HEIGHTS ROAD EXPOSES PERJURERS.

Patrick Gorman, the plaintiff in a suit for \$25,000 damages brought against the Brooklyn Heights Railroad Company, and three of his witnesses were at the conclusion of the suit arrested on warrants issued by the judge who heard the case and sent to jail in default of bail charged with perjury.

The plaintiff claimed that on the date mentioned he was driving an ice wagon toward Fort Hamilton when a car of the Brooklyn Heights Railroad Company came up behind and before he could get off the track struck him, throwing him to the street and causing the wagon to pass over him. He claimed that he received injuries from the accident, consisting of a double compound fracture of the lower leg and

INDIANA STREET RAILWAY STATISTICS.

Name.	Capital Stock.	Track.			Paid During the Year.				No. Accidents.	Paid for Damages.	No. Em-ployees.	Hours Worked per Day.	Wages, Cents, per Hour.		
		In City.	Out-side.	Total.	Wages, salaries.	Con-struction.	Equip-ment.	Repairs.					Motor-men.	Con-ductors.	Laborers.
Anderson Elec. St. Ry.....	\$300,000	9	2	11	\$ 21,581		\$ 370	\$ 10,500	78	\$ 86	40	10-11	15	15	12½
Brazil Rapid Transit Co.....	75,000	1.6	2.9	4.5	3,435	\$ 220	403	139	1	40	5	12	12½	12½	12½
J. S. Crump, Columbus.....	None.	7		7	5,340	2,000	2,000		0		9		12½		10
Indiana Elec. Ry., Goshen.....	110,000	11	1	12							15				
Elwood Elec. St. Ry.....	100,000	5		5	7,300			2,000		67	11	12			
Evansville St. Ry.....	500,000	24	3	27	77,851	11,122		3,266	114	4,556	140	12	15	15	12½
Ft. Wayne Consol. Elec. Ry.....	2,000,000	22	8	30	121,572	86,704	48,265	17,072	25	792	175		14to17	14to17	12½to38½
Hammond, Whiting & E. Chicago.....	287,000	10.32	6.12	16.44	45,508	68,624	20,858	7,233	3	1,869	35	10	16to17½	16to17½	15
Citizens St. R. R., Indianapolis.....	5,000,000	95.48	12.23	107.71	264,235			156,890	1,283	45,312	700		14to16	14to16	12½
Jeffersonville City Ry.....	50,000	2.5	.25	2.75	2,067			110			7	13			
La Fayette St. Ry.....	450,000	13	4.5	17.5	20,435	7,081	300	3,261	7	1,401	34	11½	12	12	12½
Logansport Ry.....	100,000	4.5	1	5.5					2	500	16	12	16	16	16
Madison Lt. & Ry. Co.....	Not in operation														
Marion City Ry.....	500,000	20	4	24	33,969		54,392	5,388		566	60	10¼	16½	12	12½
Lake Cities Elec. Ry., Mich. City.....		2		2					1		6	10	12½	12½	11
New Albany Ry.....	30,000	4.55		4.55	13,928			15,508	1		23	10	16½	16½	11½
N. Vernon & Vernon St. R. R.....	15,000	2		2	850			150				11			
Richmond Traction Co.....	200,000	7.25	.50	7.75	11,664			4,294			30	12	12½	12½	12½
South Bend St. Ry.....	300,000	6	3.5	9.5	8,112			1,000	4	30	50	10	15	15	12½
Terre Haute Elec. Ry.....	500,000			24	70,792		34,235	6,007	3	427	150	11	14	14	14
Vincennes Citizens St. Ry.....		5	.75	5.75	5,150				861	5	75	13	10	11	10

The Citizens' Street Railway Company, of Muncie, is capitalized for \$30,000 and has 15 miles of track, all within the city limits. During the year \$22,000 were paid for wages and salaries, and \$35,000 for repairs. There were two fatal accidents; the damage claims paid aggregated \$210.60. Fifty men are employed; the rates of wages, 11 hours constituting a day's work, are \$1.50 per day for motormen and conductors and \$1.25 for laborers.

The Indianapolis & Broad Ripple Rapid Transit Company is capitalized for \$50,000 and has five miles of track, all outside the city. During the year \$8,040 were paid for wages and salaries and \$510 for repairs; on an average 15 men are employed; the rates of wages, 10 hours constituting a day's work, are 15 cents per hour for conductors and motormen and 12½ cents for laborers.

also said that the bones of his ankle were crushed, making him permanently lame.

All the witnesses for the plaintiff testified substantially that they saw the wagon struck by the trolley car. The defendant produced a large number of witnesses who lived on the block where the accident occurred, including two officers, who testified that there was no car on the block at the time the accident happened and that the accident occurred by reason of the plaintiff, Gorman, losing control of his horses, which were running along the street.

The officers said that the horses ran into a telegraph pole, the shock of which threw Gorman out, and that the horses were slewed around upon the sidewalk.

The conspiracy was extremely well planned, the plaintiff imposing on his counsel, ex-Judge Abram H. Dailey.

## ELECTRIC TRAMWAYS IN THE UNITED KINGDOM.

(From our own Correspondent.)

The education in electric tramway matters has proceeded so far in this country that one may take it for granted that the opposition to the overhead wire has almost died out. It is true that there still lingers in more or less remote parts of the country, not even omitting London, a distinct aversion to the adoption of the overhead wire, though it is not too much to hope that even in these places the public will become sufficiently enlightened to permit the introduction of a modern system of electric tramway. It is hardly necessary to say even to American readers that the tramway question in London is very different from what it is in many provincial towns, the general rule being to keep tramways of any description entirely off the principal thoroughfares, consequently the main arteries of the metropolis such as Oxford street and the Strand have not a system of tramways within a mile. Not that the tramways in London do not play a very important part as a means of transportation, but their utility has been chiefly confined to lower class suburbs approached as a rule by mean streets and poor thoroughfares, hence it is always a difficulty to appreciate the argument of the ruling powers that the overhead system was likely to spoil the appearance of the streets.

So determined was the opposition in London against any form of electric tramways that it was generally accepted by electrical engineers that the matter must be allowed to drop for at least some years. Such, however, is not the opinion shared by J. Clifton Robinson, who is laying down an extensive system of electric trams in Middlesborough, and is at the same time the manager of the London United Tramways. Mr. Robinson obtained his enthusiasm for and experience in electric tramways in the United States, and it is to such pioneers that we are in this country mainly indebted for any progress that is made at all in the adoption of electric tramways. In endeavoring to convince the authorities of the many advantages of electric traction in those districts through which the London United Tramway Company's system passes, Mr. Robinson has called in the assistance of the officials of those local authorities in whose districts electric tramways have been in existence for some time. Fortified by these favorable opinions, Mr. Robinson has sought to bring his arguments to bear upon the various local authorities. The opinions that Mr. Robinson quotes are probably nothing more than corroborations of what you have experienced in America, but they are interesting to mention because they clearly show that the somewhat conservative officials in this country are not slow to perceive the manifest advantages of a well designed system of electric tramways. The chief point to which these opinions are addressed is, whether the overhead system would depreciate the value of property? and this undoubtedly is a very important matter considering the districts through which the London United Tramway Company's system passes. The town clerks of the various towns which have already adopted the overhead wire system, however, are clearly against the idea that any depreciation of property follows the introduction of electric tramways. The town clerk of Blackpool states clearly that the Blackpool corporation committee is convinced that there is no depreciation of property. The town clerk of Coventry,

in which town the electric tramway system has been in use for some two or three years, states that the streets through which tramways run are among the most progressive in the city. Two years' experience he states being very satisfactory on the score of safety, health, and efficiency. The town clerk of Dublin states that the overhead trolley traction has increased the value of property along the line from Dublin to Dalkey, moreover he states it to be not more dangerous than horse traction and only one accident has occurred within two years. Opinions from other towns are very similar in character and as I have said before, though opinions in themselves may not be specially valuable to Americans they serve at any rate to show the benefits that have been derived in America from the introduction of electric tramways are being reproduced here.

The question in this country with regard to electric tramways is not so much the difficulty of convincing people of the efficacy of the method, but as to which is the best authority to operate them. It has been shown over and over again in your columns that there is a great disposition on the part of the municipal authorities in this country to put down tramways and work them electrically, in many cases obtaining the necessary electrical energy from a lighting station, and so strong is this feeling among corporations that the local tramway system has been in some cases bought up entirely and is now being equipped for electrical working.

The most striking examples of this occur at Sheffield and Leeds, where the first step taken by the local authority, after the purchase had been made of the tramway property, was to lay down an electrical plant for the purpose of propelling the cars by electricity. Before the advent of electric traction, however, there was a small proportion of ordinary tramways controlled by local authorities. Out of a total of 1,031 miles 367 miles representing 42 undertakings were controlled by local authorities, the remaining 663 miles representing 117 undertakings being worked by companies. The capital expenditure of lines and works belonging to local authorities represented towards the end of last year a sum of £3,222,438 against capital expenditure of £8,177,735 for systems worked and controlled by companies. Apart from the question of electrical working there has been considerable increase in the popularity of tramways as shown by the fact that in 1894 the total number of passengers carried was 616 millions against 788 millions in 1897. There is very little doubt that the introduction of electricity on many of these lines will have the effect of appreciably increasing their popularity.

Although municipalities have shown very great anxiety to equip and operate electrical lines it cannot be said that they have made any very great progress, and we may take it for granted that much of the activity in this direction during the next two or three years will not proceed so much from the corporations as from the companies, and it is somewhat significant as showing the signs of the times when it is popularly stated that the British Electric Traction Company, which is probably the most powerful organization using electric traction in this country, has schemes in hand which will involve a capital outlay of nearly £3,000,000. In the electric tramway systems in actual operation at the present moment, the corporations do not figure very prominently and the total number is under 15 miles against something over 67 miles for companies. The following list shows the comparative difference between the two:



## ELECTRIC TRAMWAYS IN OPERATION.

Municipalities miles.	Companies miles.
Blackpool . . . . . 3.	Bessbrook & Newry . . . . . 3.
Dover . . . . . 3.5	Birminghau . . . . . 3.
Leeds . . . . . 7.	Brighton . . . . . 1.
Southend . . . . . 1.25	Bristol . . . . . 6.
14.75	Coventry . . . . . 6.
	Dublin . . . . . 11.
	Giant's Causeway . . . . . 8.
	Guerusey . . . . . 3.
	Isle of Mau . . . . . 15.
	Ryde . . . . . 7.5
	South Staffordshire . . . . . 8.
	Hartlepool . . . . . 2.56
	67.31

The municipal authorities figure a little more prominently in the lines that are under construction, but even there the proportion is not very much better than in the case of the lines in operation. The following table shows the lines under construction at the present moment:

Municipalities miles.	Companies miles.
Blackburn . . . . . 3.	Blackpool . . . . . 8.
Glasgow . . . . . 3.5	Cork . . . . . 11.
Hull . . . . . 9.5	Coventry . . . . . 5.25
Liverpool . . . . . 3.	Dover . . . . . 40.
Plymouth . . . . . 1.8	Isle of Mau . . . . . 10.5
Sheffield . . . . . 3.	Kidderminster . . . . . 4.48
23.8	Middlesboro' . . . . . 11.
	Norwich . . . . . 19.
	Oldham . . . . . 8.11
	Potteries . . . . . 12.47
	Stoke . . . . . 6.75
	West Hartlepool . . . . . 2.14
	98.70

In fairness, however, to municipalities it ought to be mentioned that at Glasgow the system which is being laid down there will in all probability be followed by a considerable extension over the whole of the system at present owned by the municipality; the same remarks also apply to Liverpool. At the same time it seems a little curious that municipalities of the size of Liverpool and Glasgow that are wholly convinced that electric traction is the best system to be adopted should trouble to make experiments on so small a scale. It is highly probable that the whole of the tramways at present existing in Manchester will be taken over completely by the corporation, and it may be taken for granted that as soon as this is done, electric traction will be applied on a very considerable scale. The extensions of the present electrical plant owned by the corporation are being made with a view to coping with the great demand that will undoubtedly arise.

Turning for a moment to the electric traction schemes that are being carried into effect in London, it is very satisfactory to observe that the near completion of the Waterloo & City Underground Electric Railway and the rapid progress that is being made on the Central London Railway, is having the effect of reviving some of the other underground schemes that were put aside some time ago. Moreover, the schemes that have been resurrected, as it were, have met so far with the approval of the legislature and it will be quite unexpected if two or three schemes that are before the House of Commons at the present moment are not carried into effect. The chief of these is the Hampstead, Euston & Claring Cross Underground Railway, which when completed will be some five miles in length and will tap one of the richest districts in London, and, moreover, will give to residents along the route a means which has never before existed of getting easily and rapidly to the west end of London.

Another important scheme is that of the Brixton & City

Railway which is designed to run alongside the existing City & South London Electric Railway. In this connection a somewhat amusing anecdote was related some two or three days ago and had the effect of causing a mild consternation among financial groups in the city that were deeply concerned in the exploitation of underground electric railways. It was simply to the effect that counsel for one of the new schemes (the Brixton scheme) announced gravely to the Parliamentary Committee that a portion of the existing tunnel of the City & South London Railway was shortly to be devoted to the cultivation of mushrooms. It was not until further inquiry that the fact was revealed that it was a joke on the part of the eminent Queen's Counsel.

The City & South London Railway is making extensions of its line to Islington and the latest inquiries show that it will be ready for opening in about twelve months' time. Considerable credit is due to this company for the manner in which it has combated and fought out the battle of underground electric railways in London. It has had at different times a legislature opposed to it, it has had the vast interests of property-owners along the line, moreover, it has had arrayed against it the authority of the Church, for in one part of the system it was proposed to burrow underneath one of the famous city churches. Still it has persevered and has practically vanquished all opposition with the result that it will very shortly have a most complete system, the extension under erection being all that is necessary to enable the company to pay a handsome dividend.

Before closing this account of the present position of electric traction interests in this country one ought not to omit to refer to the conspicuous success that has resulted in the first few months' working of the Dover electric tramways, because the successful working of this line will have very material influence upon municipalities in extending municipal schemes. The first three months have shown that the corporation has made a considerable profit and that the total cost per car-mile does not exceed 5½d.; and this is particularly satisfactory because the corporation pays a very high price to the local electric lighting company for electrical energy, viz.: 3d. per kilowatt-hour, which is, of course, very much higher than it would have cost them to generate by their own machinery. The next two or three months will show considerable addition to the existing lines. Kidderminster will probably, by the time this article appears, have been opened; Blackpool and Fleetwood will be in operation probably by June; Glasgow will be running electric cars in August; Coventry extensions are well in hand; and before July 10 miles will have been added to the Isle of Man tramways.

More important perhaps than all the Waterloo & City Railway will have commenced to run. Considering the way matters have lagged behind in this country that is by no means bad progress.

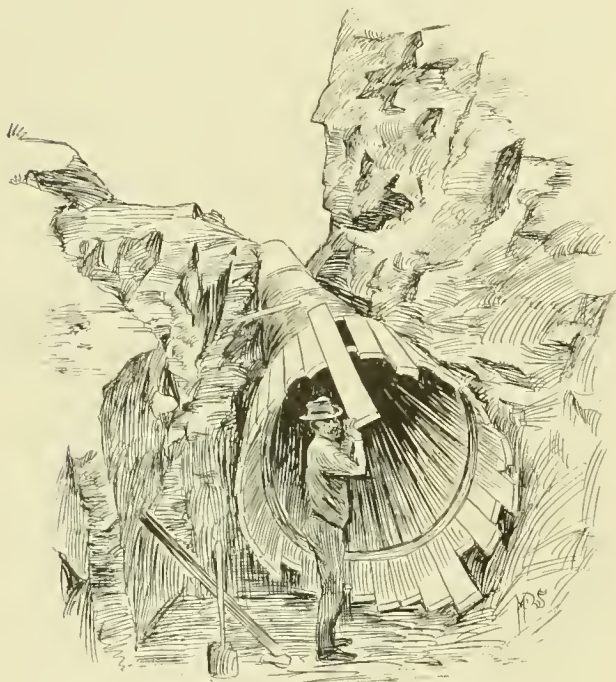
### GERMAN ENGINEERING ASSOCIATION OFFERS A PRIZE.

The German Association of Mechanical Engineers offers a prize of 1,200 marks for a plan to lift and turn trains on the elevated electric railway of Berlin. Proposals will be received up to midday October 20, 1898, at the office of the Association, 80 Linden street, Berlin, S. W. The full terms and conditions will be mailed free on application

### WATER POWER IN UTAH.

Mention has been made in the REVIEW of the project to develop power in the cañon of the Ogden river and its transmission to Ogden and Salt Lake City for street railway, lighting and power purposes. Although the plans in all details have not been carried out yet, the plant has been in successful operation for some time. A complete description appeared in the "Journal of Electricity," and we are largely indebted to that article for our data.

Great Salt Lake is about 4,300 ft. above the level of the sea, and to the east the elevation rises to an altitude of 9,000 ft. in the peaks of the Wahsatch mountains. The Ogden river in its course to Salt Lake passes for six miles through a cañon, the fall being nearly 500 ft. The stream drains an area of 360 sq. mi., the volume of water varying from a minimum of 80 cu. ft. to a maximum of 4,800 cu. ft. per second. This has long been recognized as a desirable site for a water power station, but the Pioneer Electric Power Com-



LAYING THE 6-FT. WOODEN PIPE.

pany was the first to put any plans into execution. The surveys were made in 1894 and 1895, and the work commenced in 1896.

It was the intention of the company, not only to generate current to transmit to Ogden, two miles distant, and to Salt Lake City, 35 miles to the south, but also to distribute the power to the mining camps in that region and use the water for irrigation purposes. Ultimately the entire flow of the river will be utilized by constructing a large storage dam and reservoir at the upper end of the cañon, which will have an area of 2,000 acres and a capacity of 15,000,000,000 gals. This great work is not necessary at the present time, and now a small crib dam gives the necessary head for filling the pipe line.

The pipe line leading from the dam to the station is 31,600 ft. long, of which 27,000 ft. consist of wooden stave pipe; the remainder at the lower end is riveted steel pipe. The permissible pressure for the wooden pipe is 50 lbs. per

sq. in., but on the steel pipe it is about 220 lbs. under a head of 440 ft. The line pipe has an internal diameter of 6 ft., which will deliver 250 cu. ft. of water per second, giving 12,500 h. p. available. It was necessary to cut eight tunnels in the rock, the longest of which is 667 ft., and build eight steel bridges and a timber trestle. There are many other novel and interesting details in the hydraulic plant which it is not necessary to mention here.

At the foot of the cañon is the power house, a handsome structure, standing alone in the wilderness. It is 50x135 ft., built of pressed brick with stone trimmings, and having steel roof trusses. A small building to one side is used as a machine and blacksmith shop. There are five Knight tangential water wheels, each being 58 in. in diameter and having 45 bronze buckets. Each wheel has a capacity of 1,250 h. p. at 300 r. p. m. and is direct connected to a 750-k. w. generator. Each water wheel is provided with two flywheels 6 ft. in diameter and weighing 4,000 lbs. These are placed inside of the housing on either side of the wheel and with the armature, water wheel and shaft help to maintain a uniform speed in spite of changes of head and load. On top of the housing of the water wheel is the governor, which is driven from the shaft. The governor is geared to the shaft of a worm wheel which operates an 18-in. butterfly valve. This is used in checking the speed of the wheel by reducing the pressure at the nozzles.

The generators consist of three phase 2,300-volt alternators running at a frequency of 60 cycles per second. They are of the General Electric inwardly projecting pole type with revolving armatures. The current for excitation comes from two 100-k. w. direct current generators running at 500 volts. Both of these are direct connected to a water wheel, and the output of each is sufficient for 10 alternators of the capacity installed.

The generators are connected to the switchboard by three wire 250,000 c. m. cables running through subways under the floor. The generator switchboard extends across one end of the main floor and has seven panels. Five of these are for the generators, one for the exciters and the remaining one for instruments. An alternating current voltmeter, an ammeter and a wattmeter are placed on each generator panel. On the instrument panel are the total load wattmeters, recording voltmeters, water pressure gage, a synchronizer and a ground detector. A small synchronous motor direct connected to a tachometer serves as a speed indicator. Each panel is a slab of marble 36 in. wide and 90 in. high. Two sets of three phase bus bars run the length of the board.

Above the switchboard is a gallery which supports the distributing or feeder board. This board is in two sections, 39 ft. long, and is of beautiful Vermont marble. Each section has six panels, one-half for the primary and the other half for the secondary leads. The lines to Ogden are fed direct from this board at 2,300 volts. The long distant circuits extending to Salt Lake City, 36½ miles, pass to step-up transformers.

Back of the switchboard are nine 250-k. w. single phase transformers which raise the voltage to 16,100. In the transmission to Salt Lake City 2,300 volts are lost. The transformers are ventilated by an air blast coming from two fans driven by small motors. At the sub-station at Salt Lake City transformers reduce the voltage to 2,300 for local distribution. From the sub-station extend two circuits for transmission, one for lighting in the city and one for street

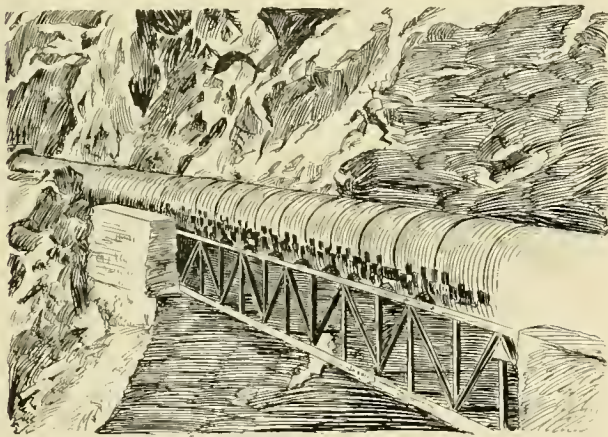


railway and power purposes. The arrangement of the switchboards is such that any generator or set of transformers can be connected to either one of these transmission circuits.

The transmission is over two lines of three No. 1 B & S wire, each transposed every mile. With the present voltage the capacity of the line is 3,000 h. p., but later it is intended to change the transformer connections and raise the voltage to 28,000, which will increase the capacity to over 10,000 h. p. The capacity of the power station will be doubled as soon as the demand for current will justify the move. The building and foundations are ready for five additional units. The transmission line has been carefully designed to prevent any interruption of service and lightning arresters are placed at suitable intervals.

The engineering problems have been carefully worked out by C. K. Bannister, who is chief engineer and secretary of the company. L. S. Boggs has had charge of the electrical features of the project.

Recently a very interesting experiment was carried out to ascertain the limits within which high voltage currents might be used commercially. F. O. Blackwell, of the General Electric Company, connected the ends of the transmission lines together at the distributing station in Salt Lake City and divided the transformers at Ogden, normally used in raising the voltage for transmission, into step-up for the outgoing current and step-down transformers for the incoming current. This gave a complete three-wire transmission circuit of 73 miles in length. The power transmitted amounted to 1,000 h. p., and the voltage at which the transmission was effected reached at times as high as 30,000 volts.



TRESTLE ON WOODEN PIPE LINE.

The current on the return was delivered to resistance vats at the power house, consisting of three wooden tanks.

By careful and repeated measurement with wattmeters at both ends it was ascertained that this power was transmitted with the loss of only 9 per cent, including 4 per cent loss in the two sets of transformers. The drop in pressure due to inductance was practically nil, the capacity of the line being sufficient to compensate for reactance loss.

Continuing the experiment, part of the Salt Lake City station load was run from Ogden, with current at 24,000 volts. This was supplied to about 500 h. p. in synchronous motors and lights for two days, under most severe climatic conditions—rain, fog, and snow alternating. In addition a

severe thunderstorm prevailed all through the night, the lightning arresters discharging repeatedly. Notwithstanding the severity of the conditions under which the test was made, the motors operated without failure and the lights burned without flickering even during the times of lightning discharges. Not the slightest difficulty of any kind developed while this experiment lasted.

By the recent accomplishment of a scheme of consolidation all the electrical plants in Salt Lake City, as well as the transmission plants, supplying current from it to the outside, have been merged into the Union Light & Power Company. The companies thus consolidated were the Pioneer Electric Power Company, the Salt Lake & Ogden Gas & Electric Company, the Big Cottonwood Power Company, the Little Cottonwood Power Company, the Citizens' Electric Light Company, and certain smaller interests.

### INDIANAPOLIS STREET RAILWAY LITIGATION.

For several years the Citizens' Street Railroad Company has been engaged in one of the most notable legal struggles that has found place in our courts, the progress of which has from time to time been reported. The facts on which the suits were based are: The passing of an ordinance in 1880 extending the life of the Citizens' franchises from 1894 to 1901. The grant of a so-called franchise in streets occupied by the Citizens' Company to the City Railway Company for a period of 30 years, beginning in 1893. The passage of the so-called New law by the state legislature in 1897, declaring the rights in the streets to absolutely terminate at the time named in the ordinance giving the franchise. The passage of the 3-cent fare law applicable to Indianapolis in the same year.

One suit between the Citizens' Company and the City Railway Company was decided in the United States supreme court in favor of the former, the franchises granted the latter by the city in 1893 being held invalid, at least until 1901, as the streets in question were already rightfully occupied by the Citizens' Company. In the 3-cent fare case now pending in the United States supreme court the Citizens' Company's claim that the law is unconstitutional has been denied in the state, and up to the present time confirmed in the federal courts.

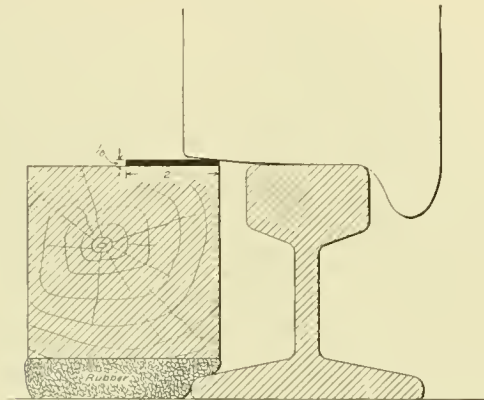
The Circuit Court of Hamilton County has recently decided in favor of the city in a suit brought by it against the two companies which claim the streets. This resolved itself into a three-cornered fight, each of the defendants agreeing with the city so far as the latter's claims regarding the other company were concerned. The court held that the grant to the City Company, which the United States supreme court decided could not in any event take effect until 1901, was invalid on the ground of public policy, the council not having power to make a contract concerning such matters in 1893 to take effect eight years later. Also it was held that the extension granted to the Citizens' Company, some seven years before the original grant expired, did not involve the same issues, being for a continuation of the service and not a new service. Also the New law was held to be constitutional.

Both companies will appeal from so much of the decision as is adverse to them.

## IMPROVED DEVICES AND METHODS FOR THE SAFE OPERATION OF CARS ON INTERURBAN AND CITY LINES.

(Continued from February.)

In connection with block signal systems for interurban roads the track instrument recently put into use on the Metropolitan West Side Elevated Railroad of Chicago will be of interest. Various complicated contrivances for making an electrical connection by the passage of the wheels of a train have been proposed and put into use from time to time. This one, however, is the acme of simplicity. It is used on the Metropolitan for giving annunciator signals at the stations telling of the approach of trains, but can also be used for block signal purposes. The accompanying drawing will make the plan plain. A piece of timber is laid just outside one rail, and on it is a strip of flat steel  $\frac{1}{8}$  by 2 in. Under the timber is rubber to afford a spring.



METROPOLITAN TRACK CONTACT.

The steel strip on top of the timber is a little above the level of the rail. The annunciator wire is connected to the steel strip and the passage of the car wheels connects it to ground.

The "Hamilton & Dayton Fast Line" between Hamilton and Dayton, O., is operated by two companies; from Dayton to Mianisburg, 11  $\frac{1}{2}$  miles, by the Dayton Traction Company and from Mianisburg to Hamilton, 27 miles, by the Cincinnati & Miami Valley Traction Company. These two companies have the same president and the same general manager, and are soon to be consolidated. Through the courtesy of the general manager, W. G. Wagenhals, we have received a description of the block signal system which has been in use on the line for over a year.

The turn-outs are located about two and one-half miles apart, and at each one is placed a signal box located on a pole sufficiently near the track so that the motorman can throw the switches without leaving the car, although the car must be brought nearly to a stop. The signal box, which is shown in Fig. 1, has a partition down the middle, dividing it into two compartments; in one are placed three and in the other two incandescent lamps, the light from each set being visible from one direction only.

The scheme of wiring is shown in Fig. 2. In each box are two double-pole switches which make contact with a ground wire or with a branch of the trolley wire. The

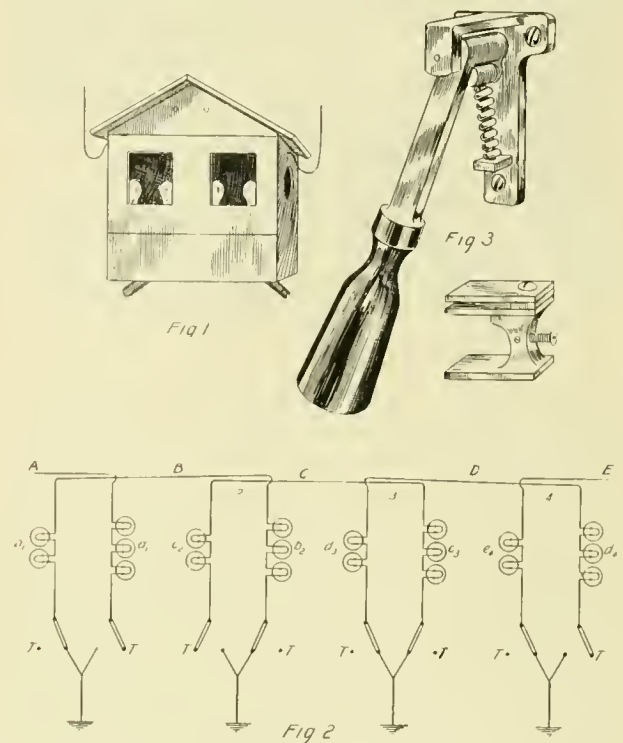
group of three lamps in one box is in series with the group of two at the next, a No. 12 iron wire being carried on poles to make this connection. Five lamps are used in series to cut down the voltage, since the lamp current is taken from the trolley wire. The life of the lamps may be increased by increasing the number in series; a good light, however, is necessary during the day, especially if colored glass is used in the boxes, to make the signal visible.

The operation will be readily understood from Fig. 2. Suppose a car to approach box No. 1, connections being as shown; both ends of line A are grounded so that the lamps,  $b_1$  and  $b_2$  are turned off; also, since the block A is protected the lamps at  $a_0$  and  $a_1$  are burning, the left hand switch at box No. 0 being on the ground contact. The motorman arriving at box No. 1, throws the left hand switch lighting the lamps at  $b_1$  and  $b_2$ , blocking any car that may be approaching on section C, or following on section A. He next throws the right hand switch, putting out the light at  $a_1$ , and also at  $a_0$ , the station behind him, and opening that block.

If on approaching a switch the box shows a light, as would be the case in approaching No. 3 from No. 2 with the switches set as shown, the car is blocked and must wait till the one in section D leaves the block, either at No. 3 or at No. 4, as its direction may be.

When two cars meet at a turn-out they merely pass and do not change the signals since both are burning, and properly protect the trains.

It is seen that where the lamps in a circuit are not burning the two switches must be either both on the ground



WIRING AND APPARATUS.



connections or both on the trolley connections, and in either case the movement of one switch only is necessary to turn the current through the lamps.

Mr. Wagenhals states that this signal system has been in operation for over a year and has given entire satisfaction. For the benefit of others who may contemplate making similar installations, it may be well to call attention to some of the difficulties encountered by Mr. Wagenhals before perfecting the arrangement. The first switches used gave no end of trouble owing to the fact that no provision was made in the way of a spring or other device to hold the switch lever in position after it was once put there. The present switch is made by a local concern and gives satisfaction; it is shown in Fig. 3. Another source of trouble was the burning of the contacts; this is eliminated in the present switch by making provision for the renewal of the contacts when they become worn.

### RIGHT OF WAY OF FIRE TRUCKS.

Nearly if not all cities have ordinances giving fire trucks the right of way over all vehicles. The only other vehicles on the streets which are sufficiently heavy and moving fast enough to make a collision with a fire truck other than a very one-sided affair in favor of the truck, are street cars. No one doubts but that it is proper for the fire department to have the right of way, but the question has arisen as to which of the parties in recent collisions was negligent and caused the accident.

Some two years ago a fire truck was struck by a street car of the Des Moines City Railway Company and overturned, and the driver, James T. Murfitt, so injured that he was compelled to resign from the service. He sued for damages on the theory that the ordinance giving to fire apparatus the right of way on all thoroughfares within the city was sufficient notice to the street car company and its employes, and that the motorman was guilty of negligence in not stopping the car when he saw the hose wagon approaching.

The case has been decided in the district court, a verdict of \$1,400 being rendered against the company. The court instructed for the plaintiff on the question of the validity of the ordinance, and stated that the question of whether or not the hose wagon could have been stopped should not enter into the case. He instructed that the question for determination was whether or not the motorman could stop the car after he saw the wagon approaching, or from the time he heard the gong striking. To this special interrogatory on this question the jury answered that it believed he could, and that he was guilty of negligence in not stopping it.

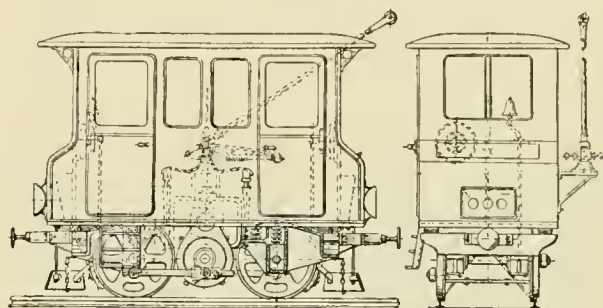
These questions have never been raised before in Iowa and the case will probably be carried to the supreme court for an adjudication. In a recent case decided in Michigan the supreme court held that driving a fire truck to a fire so rapidly that on approaching an electric street car track it is impossible to stop in time to avoid a probable collision, constitutes negligence on the part of the driver, although by city ordinances he had the right of way.

The Oneida (N. Y.) Railway Company has won in the suit brought against it by the village of Oneida for street paving.

### EUROPEAN ELECTRIC LOCOMOTIVE.

Electric lines connecting manufacturing concerns with shipping points are being built in some parts of Europe. The "Zeitschrift für Elektrotechnik" describes the latest project of this kind. A narrow gage line was built from a brewery in Zipf, Upper Austria, to the railroad station, and one electric locomotive was put in service to haul the freight cars from the station up to the brewery. The grade is almost continuous, so that after starting no tractive effort is necessary to run the cars from the brewery to the station.

The electric locomotive is radically different from those of American make. It is rather a diminutive affair, a 15-h. p. motor supplying the power. The motor is spring mounted on the axle bearings, the lower portion forming a part of the truck. The motor is bi-polar, series type with enclosed case, dust and water proof. At one end of the motor shaft is the pinion meshing with the gear, which also serves as a crank disc. Two connecting rods extend from the gear



AUSTRIAN ELECTRIC LOCOMOTIVE.

to the wheels, and in this way both axles are driven from one motor. The wheel base is less than 5 ft. and no difficulty is encountered in rounding curves.

The arrangement of the trolley stand and pole is peculiar, being placed on a bracket at one side of the cab. This was necessary, as the railroad passed through tunnels but 9¾ ft. above the rails, and the top of the cab is only 6 in. lower than that. The trolley wire is to one side of the cab and slightly above it. A rheostatic control is used and hand brakes. Very steep grades are encountered, so that the brakes, sand boxes and all the braking mechanism are carefully inspected to avoid accidents. Two seats, back to back, are provided in the cab for a few passengers who may desire transportation.

The voltage is kept at 500 on the trolley line. The current consumption is small, as the motor is generally efficiently loaded in hauling two or three small freight cars up grade. The driving wheels are 27½ in. in diameter, and with a motor speed of 290 r. p. m. the speed is only 6¼ miles per hour.

The policy of the New England states in restricting inter-urban electric roads to carrying passengers only unless legislative permission be secured, is found to inconvenience the patrons far more than the companies themselves. At each session of the several legislatures there are numerous petitions for the privilege of carrying parcels or freight, and the wonder is that a general law has not been passed ere this.

## MOTOR CABS IN LONDON.

The electric cab service, inaugurated by the London Electrical Cab Company about seven months ago, contrary to the predictions of some engineers, is still in operation. Ordinary cabbies are trained as drivers. The cabs have been carefully designed, especial attention being given to a construction as consistent with safety. The storage cells weigh 1,400 lbs. while the total weight of cab including two passengers and the cabbie is only 3,000 lbs. This compares quite favorably with battery cars which weigh about 26,000 lbs. and the cells about 5,000 lbs. In the cabs there are 40 cells with a capacity of 170 ampere-hours and a discharge rate of 30 amperes. The Electrical Power Storage Company has contracted to make all repairs and renewals at the rate of 10 per cent per year of the initial cost of the batteries, which was about \$250 per set. As may be seen in Fig. 1 the cells are beneath the body of the cab, thus giving the vehicle great stability. A 3-h. p. Lundell motor is geared to a countershaft, the reduction being 25 to 1, and from this the rear axle is driven by means of a chain. The motor has double wound armature and fields, two commutators and four poles, so that for controlling purposes it is equivalent to two machines. There are ball bearings throughout. The

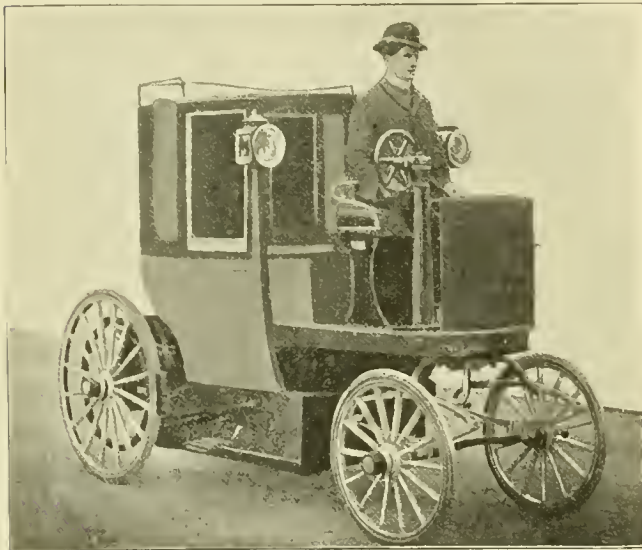


FIG. 1.—ELECTRIC CAB.

series-parallel controller is similar to that on a trolley car. The first step in starting connects the two armature windings and the two field windings in series with a small starting resistance to the batteries. This is not a running speed, but is only intended to start the motor. On the second step the windings are still in series, with the resistance cut out. With this arrangement the cab runs at a speed of about three miles an hour. The third step places the armatures in parallel, but leaves the fields in series, and the cab runs at seven miles an hour. The fourth step places the field windings in parallel, and the speed is nine miles an hour. Thus three normal running speeds allow the full energy of the current to be utilized in the motor without any loss by resistance. In the reverse direction from the top position, the series-parallel controller on the first step short-circuits the motor through the starting resistance, thereby braking the cab. On the second step backwards the motor is com-

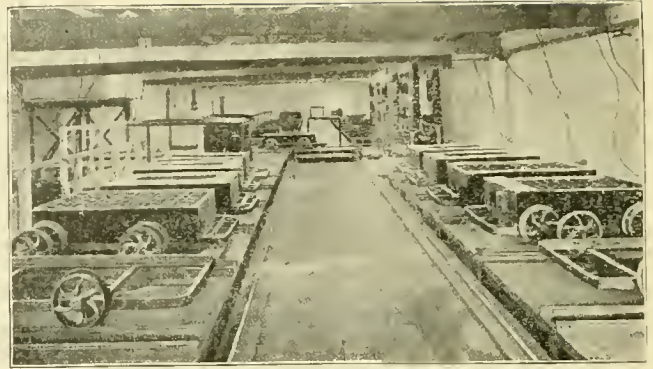


FIG. 2.—CHARGING STATION.

pletely short-circuited, bringing the cab to a dead stop, and the third step backwards reverses the connections between the armatures and fields, all being in series, to enable the cab to be moved at the slowest speed backwards. One charge will propel the cab about 50 miles at a stated cost for power of 1.5 cents per mile. Fig. 2 represents the charging gallery with the transfer table for conveying the cells from the dynamo circuits to the cabs.

## A NOVEL DAMAGE CASE.

The Brooklyn trolley lines have been accused of all kinds of crimes but it remained for a recent damage suit to provoke the assertion that the home of a law-abiding citizen would be invaded and the household effects destroyed. A woman, whose house is on the 8th street line of the Nassau Electric Railroad Company, served a complaint upon the claim department, alleging that on June 4, 1897, her furniture was damaged to the extent of \$500 due to the current from the trolley wires.

It is claimed that the trolley line in front of her residence fell to the street, was picked up by an inspector and tied to a lamp post. The current was transmitted by the gas pipe into the house and melted a lead water pipe which was in contact with the gas pipe. The water flooded the floors, damaging the furniture and carpets. Although this is alleged to have occurred in June, 1897, it is only at a recent date that the action has been brought. It is needless to say that the company is not worried about this suit, but it shows how versatile the accident lawyers of Brooklyn have become.

## NO LIEN FOR MATERIALS IN BALTIMORE.

The mechanic's lien laws of the several states have in general placed mechanics and "material men" on the same footing in providing that they shall have a lien on property for labor or materials furnished, and the action of the last Maryland legislature in amending the lien law is worthy of note. The amendment applies in the city of Baltimore only and strikes out the words "and material furnished" after the words "work done" in the old law so that now manufacturers, dealers, contractors, etc., have no lien in Baltimore for materials furnished.

The Janesville (Wis.) Street Railway Company is to try a 3½-cent fare, selling 28 tickets for \$1, the same to be used within 20 days.



## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

**Motorman Cannot be Called as if on Cross-Examination.**

The motorman being neither a party to nor a person having legal interest in, a suit brought to recover from a street railway company for the killing of a child, the supreme court of Pennsylvania holds, in Callery against Easton Transit Company, March 21, 1898, 39 Atlantic Reporter, 813, that the parties suing the company have no right to call the motorman as if on cross-examination.

**Need Not Have Intelligence of Grown Person.**

A boy has such appreciation of the danger of crossing street car tracks as to render him subject to the consequences for a failure to use his reason and senses in an effort to avoid it, the supreme court of Michigan holds, in Henderson against the Detroit Citizens' Street Railway Company, March 22, 1898, 74 Northwestern Reporter, 525, if the boy has sufficient intelligence to appreciate the danger, and has in mind the necessity of taking precautions, it not being necessary that he have the intelligence of an adult or grown person fully.

**Territorial Limit to Right to Use Invention of Employee.**

Under an agreement with an employe whereby if he invents anything of sufficient novelty to be patentable a patent is to be procured in his name at the expense of a street railway company and an assignment made to the company of the rights to use such patent or patents without payment of any royalty, the United States circuit court holds, in Earl against the Metropolitan Street Railway Company, February 19, 1898, 85 Federal Reporter, 214, that the license to the company to use the invention covered by such patent or patents would not extend without the limits of that company, as determined by its franchise at the time of the agreement to other roads afterwards acquired from other corporations, or by new extensions.

**Employment by Another Company Does Not Disqualify Juror.**

The mere fact that a juror in a personal injury case against a street railway company was in the employ of another street railway company, without a showing as to what that employment was, affords no reason, on its face, the supreme court of Wisconsin holds, March 22, 1898, for excusing the juror for cause. The disqualification, it further declares, Kohler against the West Side Street Railroad Company, of Milwaukee, 74 Northwestern Reporter, 568, could only arise upon some showing of fact from which a fair inference could be drawn that his duty as a juror in the case would clash with his duty to the company, or that his relations to the company were such as to be likely to bias his judgment.

**Duty of Motorman in Fog.**

A motorman was injured by a collision with a truck loaded with a "merry-go-around." He sued the company

that owned the truck, and recovered a judgment for damages. The testimony tended to show that there was some fog that morning, and the motorman testified that the headlight did not throw a light more than 20 ft. ahead of the car, so that he did not see the vehicle until within 20 ft. of it, while it required 25 ft. to stop the car. Under these circumstances, the supreme court of Michigan holds, La Pontney against Shedden Company, March 29, 1898, 74 Northwestern Reporter, 712, that the motorman was guilty of such contributory negligence as precluded recovery of damages and required it to reverse the judgment of the lower court. It says that the motorman knew it was entirely proper for drivers of vehicles less easy to be discovered than that with which he collided to be traveling the highway ahead of him, and that he owed a duty to such occupants of the street, as well as to himself, to use care to avoid a collision. It was the motorman's duty, declares the supreme court, to have the car under such control as to admit of its being stopped after he became able to discern objects on the track, and before a collision with such objects should occur.

**Legitimate Use of the Highway.**

The rule is stated by the court of appeals of Kentucky to be that a street railway may be placed and operated upon any part of a public street of a municipal corporation which is used by vehicles without increasing the burden of the servitude, as the right to use the land for street purposes is called, and the owner of the fee, or ultimate title, is not entitled to compensation because of such use of the street upon which his property abuts merely because he is affected by the proximity of the tracks to his property, without proof of special damage resulting therefrom.

Applying this doctrine to the appealed case of the Ashland & Catlettsburg Street Railway Company against Faulkner, the court holds, March 26, 1898, 45 Southwestern Reporter, 235, that there was nothing which would authorize a recovery of damages from the company so long as it built its railway upon the turnpike road, the track having been laid down at grade on the road, the only elevation being the height of the rails, 2 in. or 3 in., the road between the rails being ballasted with gravel and a crossing of 3-in. plank being put on each side of the track, 12 or 15 ft. long, though the east rail was but about 7 ft. from the complainant's building, which was used for saloon purposes, with the space in front formerly utilized for teams to stop on.

If the diminution in the value of this man's property arose solely by reason of the location of the road in front of his property, the court insists that this of itself furnished no ground of complaint, as the whole trend of modern authorities is to the effect that the operation of a street railway is a legitimate use of the highway, and an exercise of the public right of travel.

Justice Guffy most vigorously dissents, contending that, in reversing a judgment for \$665 damages, the majority decision was not sustained by the law and constituted an invasion of the province of the jury as to the finding of facts,

and would be far-reaching in its effects upon the rights of property holders.

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**Not Inclined to Relax Care Required at Crossings.**

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Pedestrians have the right to cross over streets and avenues, and it is obligatory upon railway companies in using the streets not to interfere with such right. This duty of looking out for passers-by is greater when cars are approaching a crossing, because at those points people in fact are more likely to be met with, and it is incumbent upon those in charge of the cars to have them under such control, and to run them at such a rate of speed, as to enable those who are crossing prudently to do so, with complete safety.

After laying down these general principles, the first appellate division of the supreme court of New York goes on to say, March 11, 1898, that it is not inclined to relax the rule as to the degree of care required of those managing street cars, as now propelled by new methods, and which in the crowded streets and at the crossings are a menace and a danger to passers-by.

But, while the responsibility and vigilance exacted of those managing the cars is increased, the court declares that it is powerless, without disturbing a long line of well-settled authorities, to absolve passers-by from observing some slight care and caution so as to avoid being injured.

It was unanimously agreed by the members of the court that there was proof given by the party suing which made it proper to submit the question of the railway company's negligence to the jury, because it appeared that the gripman in the management of his car, instead of performing his duty by observing objects ahead of him upon the track, had his attention diverted by looking at some women who were on the sidewalk.

On the other hand, the court, with two members dissenting, holds fatal to a judgment for the party suing, *Martin* against the Third Avenue Railroad Company, 50 New York Supplement, 284, the fact that there was no evidence from which the jury could have been justified in inferring that the man killed did anything, either in the way of increasing his speed or using his eyes and ears, thus manifesting that he was on the lookout for or conscious of an approaching car, or that while crossing the tracks he did ought to avoid the situation from which his injuries flowed.

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**No-Fender and Motorman Risks Assumed by Employes.**

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An employe of an electric railway company was run down and killed by one of its cars while he was engaged in the work of clearing away the dirt and refuse which had collected upon the company's track. When the company was sued for damages, for the benefit of his estate, negligence of the company was imputed to its failure to provide suitable fenders or guards for its cars, thereby rendering them unnecessarily dangerous to those of the company's employes who worked upon the track, and also in knowingly employing an unskillful and incompetent workman to operate the car which ran down this particular employe.

So far, however, as the negligence of the company in failing to provide its cars with fenders or guards was concerned, the supreme court of New Jersey thinks it enough to say

that, even if it be conceded that such omission rendered the cars more dangerous to employes working upon the tracks than otherwise they would have been, no liability can be predicted upon such negligence.

It is entirely settled both in the courts of this country and of England, says the court, that if an employe chooses to enter into an employment involving danger of personal injury, which the employer might have avoided, the employe takes upon himself the risk of all the hazards incident to the employment, the existence of which are known to him, or which are plain and obvious, and which he has no reason to expect will be counteracted or removed, and that no action will lie against the employer for injuries to the employe resulting from such dangers. Upon this principle, inasmuch as the fact that the cars of the company referred to were operated without fenders or guards was perfectly obvious, the court holds that if the operation of the railway was thereby made more dangerous, the risk of injury from such danger was assumed as one of the risks of his employment by the employe, as above stated.

As to the duty which an employer owes to its employes in the selection of their fellow servants, the supreme court says, *Chandler* against Atlantic Coast Electric Railway Company, 39 Atlantic Reporter, 674, that it is to use reasonable care and prudence therein; and, if it knowingly employs or retains in its service an unskillful or incompetent workman, it is responsible for injuries received by an employe through the unskillfulness or incompetency of such workman. This is given as the measure of duty of the company with regard to the employment and retention in its service of the motorman in question, so far as concerned other employes.

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**General Incompetency of Motorman and Private Rules Disregarded.**

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For evidence of the general incompetency of a motorman, based on the observations of witnesses who had seen him operate his car on prior occasions, to be admitted in the trial of an action brought to recover damages for injuries sustained by a stranger, a traveler on a public street, by being run into, the supreme court of Minnesota holds was error. It says that if the motorman was negligent on this occasion, the company was liable, no matter how competent he was or how habitually careful he had been on other occasions. On the other hand, if he was not negligent on this occasion, the company was not liable, notwithstanding that he may have been incompetent or habitually careless on former occasions.

The sole issue (aside from that as to contributory negligence on the part of the party suing), it further explains, was whether or not the motorman was guilty of negligence at the time of the accident. When the act or omission was proved, whether it was actionable negligence was to be determined by the character of the act or omission itself, and not by the character of prior acts of the party committing it. Were evidence of general incompetency admissible, with equal propriety could evidence of the general carelessness of the party suing be proved, upon the issue of contributory negligence.

Moreover, while there are a few cases which maintain that rules such as those of a street railway company intended only for the guidance of its own employes in the operation



of its cars may be introduced in evidence to show what duty the company owes to the public in the operation of its cars, the supreme court of Minnesota takes the position that the private rules of a company, intended only for the guidance of its employes, and not known to the person suing it, are not admissible in evidence for any such purpose. It declares, Fonda against the St. Paul City Railway Company, February, 1898, 74 Northwestern Reporter, 166, that a company can not, by the adoption of private rules, fix the standard of its duty to others, and that it may, out of abundant caution, adopt rules requiring of its employes a much higher degree of care than the law imposes,—a practice which ought to be encouraged, and not discouraged.

Finally, it holds that the company having omitted to call its motorman as a witness, although within reach and available, the trial judge was, under the circumstances, justified in instructing the jury that in weighing the effect of the evidence actually introduced, they were at liberty to presume that the testimony of the motorman, if introduced, would not have been favorable to the cause of the company.

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#### Negligence Does Not Excuse from Use of Care.

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Although the person suing to recover damages for personal injuries may be guilty of negligence, the company sued cannot thereby excuse itself if, by the exercise of due care, its agent could have avoided the accident, after discovering the negligent party in his perilous position. This rule, which has been adopted as an exception to or modification of the general doctrine that a person suing who is guilty of contributory negligence cannot recover damages, the court of appeals of Maryland says is a very just one, as the law will not permit the loss of life, limb, or even property, to be deliberately and carelessly inflicted, when it could by reasonable care and caution be avoided, merely because the injured person was negligent. However, it adds, the rule should not be extended too far, but should be kept within proper bounds.

When it is clear that the person suing was guilty of negligence, there must be evidence from which the jury can fairly and reasonably find the company liable for violation of duty after the person suing has thus negligently placed himself in danger, in order to avoid the legal effect of his own negligence.

To illustrate: the court holds, in the appealed case of Baltimore City Passenger Railway Company against Cooney, March, 1898, 39 Atlantic Reporter, 859, that if a boy 11 years of age, of whom there was no evidence that he was deficient in his mental faculties, did stand for three or four minutes in the center of the track with his back towards the direction from which the car approached, he was clearly guilty of negligence, but that would not justify the motorman in running over him.

On the other hand, if, in point of fact, the boy was not on the track, and not in the way of the car, the court says that there was no reason, so far as he was concerned, to sound the gong. If he intentionally got on the track just as the car reached that point, without first looking to see if a car was coming, he was guilty of contributory negligence; and, if he got on by stumbling and falling on the track too late for the motorman to see him or to prevent running over him, the company was not liable.

The court further holds that it was error to refuse to permit the company to ask its master mechanic whether a boy could "steal a ride" on the car that ran over the one suing by hanging on the ledge on the side of the car, and putting his feet on the truck or bar between the truck and wheel guard, when its theory of defense was that he was injured in that way, though questions could not be propounded with reference to other cars.

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#### Liability in Maintaining Pleasure Grounds.

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A Massachusetts statute of 1895 authorizes street railway companies to acquire, hold, equip, and maintain real estate to be used for purposes of recreation and for pleasure resorts, the admission being free.

By virtue of this statute the Lowell, Lawrence & Haverhill Street Railway Company maintained such a place on the line of its railway, which contained a large platform or stage for exhibitions. The company entered into a written contract with a manager, under which the latter furnished and managed various entertainments there, and, among them, an exhibition of markmanship by a man born without hands. It paid for advertising these exhibitions, and carried posters on its cars.

A man by the name of Thompson, having seen an advertisement, was a spectator at an exhibition of markmanship, going to the place on one of the company's cars. Immediately after a shot had been fired, something struck him in the eye. There was no suggestion that he was not in the exercise of due care, or that he was not in the place provided for spectators.

All the appliances were furnished by the manager or the performer, and nobody in the company's employ exercised any supervision or control over the performance. A butt was provided to receive the bullets, and on the evidence the jury might find that the man was struck in the eye by a small fragment of a bullet or other metallic substance which flew from the impact when the bullet hit the butt, though it was not made plain just how the accident occurred.

Thompson obtained a verdict for \$5,045 against the street railway company. This, the supreme judicial court of Massachusetts refuses to disturb, April, 1898, 49 Northeastern Reporter, 913.

It holds that the jury were properly instructed that the company was not responsible unless the exhibition was in its nature such that it would necessarily or probably cause injury to some person present under its invitation, unless guarded against, and the company failed to exercise due care to prevent harm. The fact that the exhibition was provided and conducted by an independent contractor, it says, would not wholly relieve the company from responsibility, provided it was of such a kind that it would probably cause injury to a spectator, unless due precautions were taken to guard against harm.

The court holds that the case was rightfully submitted to the jury, and that the evidence would sustain a finding that the accident happened from a cause that ought to have been foreseen and guarded against by the street railway company. Nor does it consider that the spectator assumed the risk. It says that he might well rely on those who provided the exhibition, and invited him to attend, to take due care to make it safe from such an injury as he received.

#### Power to Prescribe Frequency of Running Cars.

The supreme court of Michigan holds, in *People against the Detroit Citizens' Street Railway Company*, March 15, 1898, that the common council of the city of Detroit had the power to adopt an ordinance, in February, 1897, requiring the street railway company to "provide sufficient cars upon Gratiot avenue so that a 6-minute service shall be given upon said avenue between Mack and Sheridan avenues between the hours of 5:30 a. m. and 10 p. m." In reaching this conclusion, it maintains that the ordinance of 1897 involved was given and accepted with the understanding of all parties to it that the provision in section 4 "that the cars on all lines subject to this ordinance shall be operated as the public convenience may require and the common council order" should control, rather than that that ordinance should be so taken as an extension of the 30-year ordinance of 1862 that its provisions not requiring more than three cars an hour during the day should govern.

If, under the contract relations existing between the city and the company, the former had the right to pass the ordinance of 1897 referred to, the supreme court further holds that the common council had a right to provide a penalty for its violation.

It was said, in substance, that if the power to determine with what frequency the cars should be run was lodged with the common council, the chances were that the public interests would not be subserved, but private spites and hatreds gratified, and that a corrupt council might sap the life blood of industries in cities unless the corporations should "see" the members of the council. But the answer of the supreme court to that is, 74 *Northwestern Reporter*, 520, that it cannot presume that members of a common council are actuated by improper motives, or that their actions towards corporations are actuated by improper motives.

Conceding, however, the above contention to be true, the court says that there would be two remedies. First: The aid of the criminal law should be invoked to punish alike the members of the council whose official acts are influenced by corrupt means, and the corporation which makes use of the corrupt methods to improperly influence official action. The second remedy is for the people to elect honest members to the common council.

The common council acts as the public and municipal agent, and, in the passage of an ordinance affecting subjects of municipal administration, it should and will be presumed that the council acted in the exercise of a judgment upon the facts, and their judgment must control until it has been shown that it has been improperly exercised.

Yet, if it was clearly made to appear that the action of the council was capricious and arbitrary, or that the public convenience did not require the provisions contained in the ordinance, the supreme court suggests that, without doubt, the courts might intervene.

But, without trial, it thinks, no one could say that the provisions of the ordinance were unreasonable.

#### Right to Leave Car Unblocked on Side Track.

A small flat car weighing from 1,500 to 1,800 lbs. was detached from the motor car and left on a side track, in a public highway, at Port Huron, Mich. The car had no brake, and there were no blocks or anything put under or beside

the wheels to prevent the car's being rolled, according to some of the testimony, although the conductor testified that he blocked the wheels with a stone and a stick, which could be removed, however, by the kick of a small boy, if he hit it hard.

A little girl, nearly seven years of age, coming from school saw eight or ten children playing with the car, pushing it a short distance west, and then returning it east, some riding and the others pushing. She climbed upon one end of the platform to ride, and, without having got into the box, either slipped or was pushed in the play from the car, falling in front of the wheels, one of the wheels running over her leg, and causing injuries to recover damages for which the street railway company was sued.

This brings out an interesting decision by the supreme court of Michigan, wherein it reverses a judgment entered against the company and denies a new trial. It says, *Kaumeier against City Electric Railway Company*, March 15, 1898, 74 *Northwestern Reporter*, 481, that the car in question was not dangerous in its construction, which it considers takes the case out of the rule adopted by the supreme court of the United States and the great majority of the state courts relative to leaving a turntable or other like dangerous machinery, likely to attract children, unsecured.

True, the car stood upon a track where it might be moved by several children applying their united strength. So might several children, in the same way, move a wagon or carriage left beside the highway. But the court says that it apprehends that no claim of negligence could be sustained against the owner of such a vehicle if one of the children climbing upon it should fall off, and be run over, even if the wheels were left without blocking. Therefore, assuming that the company left the car without sufficient blocking, the supreme court says that it must be held that this suit could not be maintained against it, for the reason that there was nothing in the case showing or tending to show any negligence on the part of the street railway company.

The court does not think it necessary to say that the little girl was a trespasser in going upon the track there, which was laid along the highway. But it does declare it proper to say that she was a trespasser in any attempt to use the car.

The street railway company had just as much right, is the final assertion of the court, to leave the car where it did as would a farmer have to leave his wagon or carriage upon his own side of the highway, and no one would have the right to move it, except upon the claim that it impeded public travel. The car being rightfully left where it was upon the track, and not being a dangerous thing in itself, the trial court should have directed a verdict in favor of the street railway company.

#### As to Liability for Malicious Prosecution by Conductor.

Assume, for the sake of argument, that a person entitled to ride on a street car without paying additional fare is not only wrongfully ejected therefrom by the conductor for refusing to pay additional fare, but is arrested and prosecuted at the instance of the conductor for violating a city ordinance making it a misdemeanor for any person to ride on a street car without paying his fare, and that from the conductor's acts in relation thereto malice on his part may be inferred,



will the street railway company be liable for the acts of its employe, the conductor, in this regard? The supreme court of Arkansas makes these assumptions, in order to squarely decide the question stated, in the appealed case of the Little Rock Traction & Electric Company against Walker, March 19, 1898, 45 Southwestern Reporter, 57.

There was no proof here of an express authority from the company to the street car conductor to prosecute a passenger for refusing to pay his fare. Moreover, the court declares that there was no connection whatever between his authority to put a delinquent passenger off his car (given expressly under the rules of the company), and thus prevent a further imposition on the part of the passenger, and the authority to arrest him and prosecute him for a violation of the criminal laws in attempting to ride on the car without paying his fare.

But, to prevent this case being set down as an unlikely one of repetition, it is important to notice that the conductor, according to his own testimony, only directed the policeman he called to put the passenger off, while the latter testified that he was directed to arrest him and take him off, and the court thinks that in all probability the conductor never intended to do more than put the passenger off the car, never having the idea of prosecution, malicious or otherwise.

And the court holds that the limited authority of a car conductor from the company to put a delinquent passenger off cannot be enlarged by his calling to his aid a policeman, whose general powers as such are to make arrests and prosecute for violation of the municipal law. Nothing else being said, in such a case the policeman is called in to aid the conductor in the execution of the conductor's powers, and not those belonging to his office generally.

Of course, continues the court, the conductor could have independently, and on his own responsibility, caused the arrest to be made, and could have prosecuted; but its decision is that he could not do so as conductor of the street car, and bind his company, without express authority being shown.

For these reasons, the supreme court reverses a judgment rendered against the company, Justice Wood dissenting.

The contention of the dissenting opinion is that, in order to maintain a suit of this kind against the corporation, it is not necessary to show that its agent, who instigated the malicious prosecution, or at whose instance it was brought about, had any express authority from the corporation to do the act complained of, but that such authority may be and will be implied if the agent in doing the act is acting within the scope of his real or apparent authority.

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#### Electric Railways in Country Highways.

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One of the most important legal questions of today, and one that is becoming more and more pressing every day, is whether passenger railways operated by mechanical power can be laid over country highways without consent of, or compensation paid to, the adjoining landowner; or, in technical language, are they additional burdens to the fee?

It is well settled that a horse railway upon a city street, built upon grade, and for the carriage of passengers only, is not an additional burden. So, too, the drift and weight of authority seem to be that the operation of the road by electricity or other mechanical power does not change the nature of the road in this respect, although it is held by

some courts that, if permanent erections in the street interfering with the right of access are necessary for the operation of the road, these may constitute an additional burden.

But that there are many and marked differences between the uses to which a city street is put and the uses to which a country highway is put cannot be denied; nor can it be denied that the uses contemplated when the land is taken for electric railway purposes vary widely, except that both are intended for purposes of travel.

The street railway in its inception is a purely urban institution. It is intended to facilitate travel in and about the city, from one part of the municipality to another, and thus relieve the sidewalks of foot passengers and the roadway of vehicles. It is thus an aid to the exercise of the easement or right of passage; strictly, a city convenience, for use in the city, by people living or stopping therein, and fully under the control of municipal authorities, who have been endowed with ample power for that purpose.

This strictly urban character of the street railways remained practically unchanged for many years, and during these years the long line of decisions grew up recognizing the street railway as merely an improved method of using the street, and rather as a help to the street than as burden thereon.

Time, however, has made changes in conditions. New motive power has been discovered, and it is found that by its use an enlarged city street car may profitably run long distances, and compete to some extent with the steam railway. It is proposed to convert the city railways into lines of passenger transportation, covering long distances, and connecting widely separated cities and villages, by using the country highways, and operating long and heavy coaches, sometimes made up into trains of several cars. Thus, the urban railway has developed into the interurban railway, and threatens soon to develop into the interstate railway. The small car which took up passengers at one corner, and dropped them at another, has become a large coach, approximating the ordinary railway coach in size, and has become a part, perhaps, of a train which sweeps across the country from one city to another, bearing its load of passengers ticketed through, with an occasional passenger picked up on the highway. The purely city purpose which the urban railway subserved has developed into or been supplanted by an entirely different purpose, namely, the transportation of passengers from city to city over long stretches of intervening country.

When this train or car, with its load of through passengers, is passing through a country town, it is clearly serving no township purpose, save in the most limited sense. This through travel is unquestionably composed of people who otherwise would travel on the ordinary steam railway, and would not use the highway at all. Thus, the operation of this newly-developed street railway (so called) upon the country road is precisely opposite to the operation of the urban railway upon the city street. It burdens the road with travel which would otherwise not be there, instead of relieving it by the substitution of one vehicle for many.

These considerations, pointed out by the supreme court of Wisconsin, in the case of Zehren against the Milwaukee Electric Railway & Light Company, 74 Northwestern Reporter, 538, wherein it handed down its opinion March 22, 1898, lead the court to hold that an interurban electric rail-

way, running upon the highways through country towns, is an additional burden upon the highway. However it may regard this development of the urban into the interurban railway, it says that it seems to it utterly impossible and illogical to say that it is essentially the same in its purpose or effects as the mere street railway which it early decided was not an additional burden on the fee. The difference between the two, it explains, is not so much in the change of motive power, as in the entirely different character of the use. Suppose a steam railway corporation were organized to carry passengers only from city to city, and should attempt to lay its track upon the country roads without compensation; is there any doubt, the court asks, but that it would be held that it could not do so? It thinks not.

Even granting all this, it was further argued, in this case, that a distinction should be drawn between a highway in close proximity to a city, or running between the city and a neighboring suburb, and the ordinary country road through a farming district. The suggestion, the court admits, is not without weight, as there is much difference between the practical uses to which the two highways are generally put, the suburban highway very frequently approximating closely to the city street. But while the difficulty in drawing any clear line of demarkation between the two is very great, the court says that if a line be drawn in one case upon the facts of that case, depending upon mere proximity, or upon the manner of use, or the density of population, or the prospect of rapid settlement, or upon all of these circumstances together, it cannot apply to any other case; and the question will always be one of doubt and embarrassment, leading to different conclusions in different courts, whereas, if the line be fixed at the limits of the corporation, it will at least have the great merit of certainty, and be capable of unerring application. Presumably the city limits include the entire urban area, and the court says that it feels, under all the circumstances, that it is the true and proper line.

Furthermore, conceding for the moment that the highway in question should, although outside of the city limits, be treated as a city street, the court holds that the grade cannot be changed by, and primarily for the sole benefit of, a street railway company, and, more particularly, that the latter cannot cut down the highway, say, 8 ft., so that an abutting owner's right of access to his property will be seriously impaired, without the latter's consent and without payment of compensation to him.

#### FIRE AT NEWBURYPORT, MASS.

On April 9, about 9 p. m., fire broke out in the planing mill of the Newburyport Car Company, and quickly spread to the machine shop, dry house and other near-by buildings, which were destroyed notwithstanding the efforts of the fire department. The paint shop was saved, but a new building in process of erection was badly damaged. The loss to the company and lessor was about \$30,000, covered by insurance. It is charged that the fire was of incendiary origin.

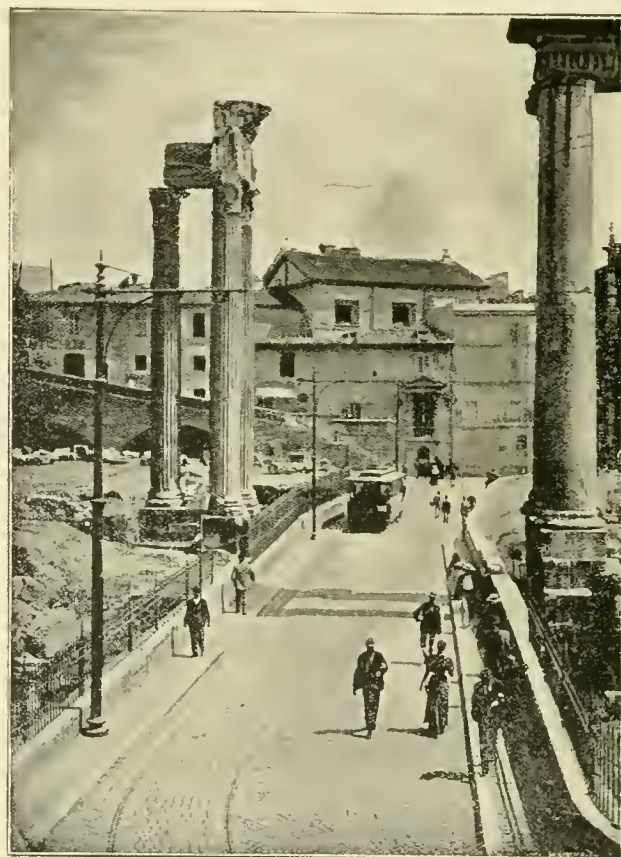
Some boys strung a piece of barbed wire across the track of the Pawtucket Street Railway Company at the village of Lonsdale, thinking to have some fun, and nearly succeeded in decapitating the motorman of the car that struck it.

#### FOREIGN ORDERS PROMPTLY FILLED.

The Sheffield letter to the "Hardware Trade Journal," an English publication, details the experiences of an English merchant who wanted goods in a hurry. He cabled to America for a considerable quantity of material, and within nine days it was at Liverpool; on another occasion he cabled for 60 electrical specialties, and though they were not kept in stock, they were promised in 14 days. The correspondent stated that a manufacturer in Sheffield had complained of his inability to secure malleable castings of satisfactory quality or in sufficient quantities without importing them from the United States. Another surprise was the preference expressed by the men in this shop for American-made files, which were used in large quantities.

#### THE ELECTRIC TRAMWAYS IN ROME.

Following the example of Milan, the Eternal City permits the use of the overhead trolley and does not hesitate at the invasion of the Capitol itself. About a year ago three miles of track were laid down, and recent additions bring the total length up to 14.25 miles. Electricity is generated by water power at Tivoli, 18 miles from Rome, and transmitted at an initial pressure of 5,000 volts, the total drop being about 20 per cent. At Rome the current is first reduced to 2,000 volts and then transformed to a continuous current at 500 volts in rotary transformers. These transformers are three in number, each of 80 k. w. capacity. A storage battery of Tudor cells is used in con-



CROSSING THE RUINS OF THE CAPITOL.



nection with the transformers and provides for the fluctuations in the load; during two or three hours in the evening the turbines at the water plant are shut down and the road operated by the battery alone.

The grades on the line are many and some of them are



PIAZZA VENEZIO-SAN PAOLO LINE.

as steep as 8 per cent; the curves vary in radius from 66 to 77 ft. The track is laid with Phoenix rails of girder section weighing 67 lbs. The rails are bonded with double copper bonds; at intervals of 150 ft. there are cross bonds, and every 500 ft. the four rails of the two tracks are cross bonded.

There are 43 motor cars with capacity for 16 first-class



JUNCTION OF VIA BONNELLA AND VIA CAVOUR.

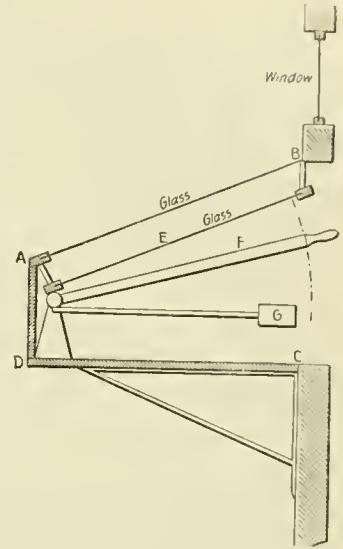
passengers and six second-class, and standing places for eight more on the rear platform. The car equipment is Thomson-Houston.

The illustrations are reproduced from the Railway World, from which the data here given were taken.

The Lake Street Elevated has changed the signal lamps on its line to conform to those used by the Union Loop and Metropolitan Elevated, and will soon be followed in this by the South Side Company. The colors are now red for danger and green for clear.

A BLUE PRINT WINDOW.

A writer in "Engineering News" describes a very convenient arrangement for a blue printing frame which is in use at the Edge Moor Bridge Works. In the blue print room are special windows the glass in which serves as a part of the frame and the labor and annoyance of pushing the frame outside of the window is saved, to say nothing of the exposure to which the ordinary apparatus exposes the manipulator in windy weather.



The window A, B, C, D, projecting from the side of the building, contains the fixed glass E, and the movable frame F, counterweighted by the arm and weight G. The frame F is covered by a bed of cotton wool held in place by a square of ordinary carpeting, and closes up tight against the glass E. The sensitive paper and tracing are simply placed in the proper position on the frame, which is closed up against the glass for printing and lowered for inserting and removing the paper and prints. As all drawings are made upon sheets 26½x35½ ins., the frame F is made just large enough to hold these sheets.

MAY PAY FOR STREET IMPROVEMENTS IN INSTALLMENTS.

March 31, the circuit court of Vanderburgh county, Ind., rendered a decision in the case of the Evansville Street Railway Company against the city of Evansville, the mayor and the common council asking for an order to compel the passing of an ordinance giving the street railway company the right to pay for its street improvements in 10 annual installments, as authorized by the law passed in 1897. The city in its defense had claimed that the old ordinance providing for a single payment by the company was a contract which the legislature might not impair and denied the constitutionality of the law of 1897.

The court held that the company might pay in 10 installments.

It will be remembered that the Terre Haute Street Railway was thrown into a receiver's hands because the mayor vetoed such an ordinance as the Evansville council was asked to pass.

The success with which the interurban line between Milwaukee and Kenosha has met during the 15 months of its operation has no doubt had a great deal to do with stimulating the project for an electric line from Chicago to Milwaukee. With the completion of a road now building north of Chicago, four-fifths of the distance between the two cities will be covered and that interval can not be expected to be left open long.

## PLEASURE RESORTS IN 1898.

What the Street Railways Will Provide for the Coming Season at Their Parks—The Storage Battery Pleasure Boat—The Expediency of Offering Inducements to Societies and Organized Bodies—Experience of the Schenectady Railway Company—New Parks.

With the approach of summer the question of, What shall we do with our parks or pleasure resorts? confronts the managers of those street railways which have these features as an incentive to travel. In making the decision there are a few fortunate ones who need not consider the item of expense and are limited in choosing attractions only by what the experience, of themselves or of others similarly situated, has shown to be successful in providing recreation and amusement for pleasure seekers. Others must economize and will be most interested in learning what may be home-made at small expense, and yet prove attractive features at a resort.

What will prove a success in one city does not always do so in another; the public is fickle in its tastes, but may to a considerable extent be persuaded to like a thing, and here the ingenuity of the promoter has full play. In the succeeding pages will be found some information as to what has been found good, and what poor attractions, some points on what can be made by the company, and what are the plans for the coming summer.

A most attractive feature of a pleasure resort near a body of water, would be mechanically propelled boats. Electric launches would be better suited than any other kind, as the current for charging storage batteries could be conveniently taken from the trolley circuit. The electric launches on the lakes in Jackson Park during the World's Fair were immensely popular and profitable in spite of the great initial cost and the still greater cost of maintenance.

There are few street railway resorts whose patronage would justify the investment of \$1,500 for an electric launch.



BOAT WITH ELECTRIC PROPELLER.

Rather than incur such an expense the boats could be equipped with the batteries, motors and propellers in the repair shop of the company. However, it is not the party boat holding from a dozen to a score of persons that will receive the most patronage but the smaller ones about the size of an ordinary row boat with seats for two or four persons. The number of couples who would ride on the water

would be many times the number of parties, and the expense of such service must be within the means of the average patron of a popular resort.

An equipment has been perfected in Minneapolis by S. N. Smith and T. B. Hatch, of the Monitor Electric Company, by which such boats can be run by an electric motor and propeller, as shown in the illustration. This apparatus is composed of two parts; the propeller and motor hung on the outside at the stern, and the battery placed anywhere in the bottom of the boat. The former can be attached to any boat in a few minutes.

The batteries may be either of two kinds, storage or primary, either of which will run a large-sized row boat four to five miles an hour. The storage battery is in two parts, together weighing about 80 lbs., and will run five hours continuously or seven intermittently. The primary battery is somewhat heavier and will do the same work for four hours continuously, or six hours on intermittent runs such as a pleasure seeker would make on a day's outing, which may, however, be increased to two hours more by a slight additional charge to the old solution. The primary battery costs from 50 to 75 cents per charge, according to the quantity of chemicals purchased and the locality of the purchaser. The charging is very easily accomplished by any one, using water and dry salts or powders.

The propeller and motor are in one part and weigh complete about 20 lbs. The whole is nickel-plated and presents a fine appearance. A fast and slow speed switch is conveniently placed on the cover, which latter hinges back and exposes to view all of the mechanism that requires inspection. The oiling is all done through a single oil-hole which lubricates the whole machine.

Steering is effected by means of a hand wheel surrounding the motor case, the turning of which steers a boat much more readily than a rudder. The boat may be made to turn completely around upon its heel. Reversing is instantly accomplished by turning the wheel half a revolution, thus causing the boat to immediately back up without stopping the motor. The mechanical and electrical details have been very carefully worked out and perfected. The extremely light weight and the power and efficiency are its features. It is practically noiseless, and emits no fumes or vapors. The price of these outfits range from \$100 to \$125, complete for each boat. One of the illustrations shows a boat so equipped going at full speed through the water.

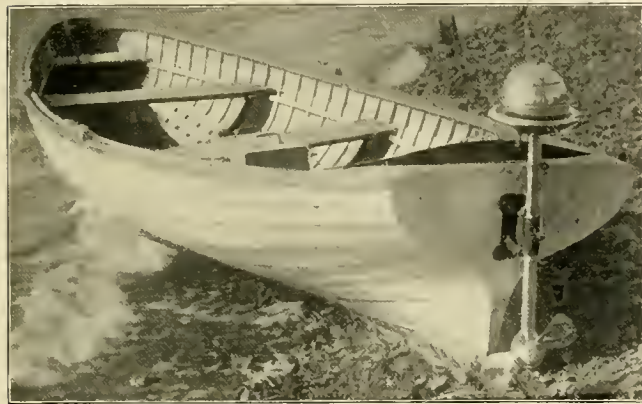
#### Toledo.

The Toledo Traction Company has as a pleasure resort the Lake Erie Park and Casino, which it advertises extensively throughout the state by means of large colored lithographs, so that a stranger in search of amusement need not remain ignorant of where to go. Music is a never failing attraction and a band of 20 pieces gives two concerts daily. The attractions comprise a theater, a merry-go-round, a scenic railway, boating, pony track, mystic maze, swings, etc., and this season a zoological garden, palm gar-



den, aquarium, bowling alley and bicycle track are to be added; of these the zoological garden, aquarium and theater were built by the company. Admission to the park is free to passengers on the railway and a fee of 5 cents is charged for others. All the concessions except the cafe are rented out. The company endeavors to induce excursions of secret, military and business organizations coming to Toledo to hold meetings at the park.

The general manager, Thomas H. McLean, states the experience of the company to be that high-class vaudeville entertainments take best and dramatic companies are failures. He thus tells how to make a summer resort a suc-



SHOWING THE PROPELLER.

cess: "Cater to ladies and children; give only clean, moral entertainments; maintain good order; uniform all attaches; give two performances and band concerts daily; look after the comfort and safety of your patrons; work in conjunction with the steam railroads for excursion business."

## Cleveland.

At Cleveland what is called the Park System of the Akron, Bedford & Cleveland and the Cleveland, Painesville & Eastern Railroad Companies is managed by C. F. Bates, who writes as follows: "We will, this year, operate two parks; one on the line of the Akron, Bedford & Cleveland Railroad, situated 30 miles from Cleveland and five miles from Akron; and another on the Cleveland, Painesville & Eastern Railroad, 16 miles from Cleveland. You will readily see that the long haul from the city makes our condition very different from almost all street railway parks, and consequently our work this year will be entirely experimental. Our equipment will enable us to reach these parks very quickly and we will unquestionably have a very great amount of Sunday school traffic, but we hope that the great natural beauty of our parks, with their especially good bathing facilities, will give us a large amount of transient traffic."

## Duluth, Minn.

The Duluth (Minn.) Street Railway Company has no amusement place on its line other than a pavilion located at the head of its incline railway, the second floor of which is fitted up as a summer theater, the lower floor being used as a restaurant and promenade with balconies looking out upon the lake. The company has not completed arrange-

ments for the coming season, but will probably have operatic, dramatic and vaudeville entertainments as in the past two or three seasons.

## Philadelphia.

John B. Parsons, vice-president and general manager of the Union Traction Company, Philadelphia, states the company has contracted with T. P. Brooks to have his Chicago Marine Band give concerts during the summer at Willow Grove Park, and expects to continue to conduct the park this season, keeping to the same high standard as has prevailed for the past two seasons; no material changes will be made in the matter of attractions.

## Marinette, Wis.

President H. C. Higgins, of the Marinette (Wis.) Gas, Electric Light, Street Railway & Power Company, has had some experience with pleasure resorts, and in his address before the Northwestern Electrical Association recently said: "Do not lay any extra line in order to establish a park, unless you can establish it on the edge of a body of water and a town of not less than 30,000 people to draw from. Do not lay out much money on animals for your park. Do not run vaudeville or other shows unless you are so situated that their transportation will cost you but little. I believe that parks should be enclosed and no one admitted unless he pays car fare." The company's park is conducted along these lines; an admission fee of 10 cents is charged for others than passengers. At the park are a hotel, band stand, dock, bath houses and a fleet of boats, all of which were built by the company. These concessions are rented as a whole. As stated, Marinette proved to be too far from the base of supplies to make vaudeville a success and such shows were abandoned. Now the principal attractions of that nature are band concerts given each Sunday, and base ball games.

## Schenectady, N. Y.

The park of the Schenectady (N. Y.) Railway Company is known as Brandywine Park and is situated on a high and sandy bluff on the edge of Brandywine Lake, 13 minutes' ride from the New York Central Passenger Depot, on the line of the electric street railway, whose tracks run into the park and up to the steps of the main buildings.

The park has been well and securely fenced so that no entrance can be obtained except at the proper gate, at which a ticket office has been erected. The banks of the lake are well shaded with large trees, and have been drained, terraced and sodded; cinder paths have been laid out and plenty of seats and a boat-landing built. The body of the park is laid out with fine cinder walks around the buildings, additional shade trees have been planted and all the surface except that taken up by the buildings, walks and flower beds, made into a beautiful grassy lawn where tennis, croquet, lacrosse or other games may be played.

The main buildings comprise:

A large covered Casino, with stage, dressing rooms and a fine dancing floor 50 ft. by 60 ft. The dancing floor has seats around it, and if it is desired to use the building as an auditorium, chairs and settees to comfortably seat 600 peo-

ple have been provided. The floor is raised 6 ft. above the ground, and with the high sides and projecting eaves dancing or any entertainment can be continued during the heaviest rain, while its steep roof and open sides render it cool and pleasant during the hottest weather. At night it is lighted with arc lamps and several hundred incandescents.

Closely adjacent, a handsome covered refreshment pavilion, with tables, chairs, refreshment counter, ice-box and a separate kitchen or serving room, with stove, tables, sink, etc.

For societies desiring to use or sell beer, a Tivoli or covered beer hall has been erected in a shady portion of the park and surrounded with a lattice fence large enough to allow the use of tables outside the serving counter.

A large, raised open stage with railing, for use of wrestling, boxing or any open air contest, show or entertainment.

Ample toilet facilities have been provided.

Good, strong safe boat-swings have been provided for the free use of the children.

There are two fine running springs on the lake bank, two deep drive wells have been sunk and the company has also installed an electric pump by which the lake water is piped all over the grounds for sprinkling or toilet use.

At night the grounds are brilliantly lighted with both arc and incandescent lamps from the company's own power plant, and attendants are at all times on the grounds to enforce order or prevent the entrance of drunken, disorderly or disreputable persons.

The street cars run to and from the park every 15 minutes from 6 a. m. to 10 p. m., and on holidays, days of picnics, etc., they run every  $7\frac{1}{2}$  minutes until the picnic, etc., is over.

H. S. Cooper, secretary of the Schenectady Railway Company, has very kindly written us at some length regarding the experience of that company in the management of the park. He says:

"This city has many secret societies, labor organizations, religious, philanthropic, and benevolent associations, and pleasure clubs, besides the churches, Sunday school and church societies. We have found our best revenue to come from the annual gatherings of these bodies at our park, and we have therefore fitted it up specially for the accommodation of them. We rent them the park complete with all the privileges, for a sum that will cover the fixed charges, maintenance and operating expenses and depend for our profit on the traffic that such events create. We advertise these events (free) in the cars for some weeks in advance, and on the day that it occurs we advertise it by streamers on the outside of the cars. A special form of contract is used.

"Once or twice a week—on dates when we have no event booked—we give an evening dance from 8 to 11 p. m., furnishing good music, brilliant illumination and a fine dancing floor. On these occasions we make a charge of 10 cents each for the men—the ladies we admit free as an attraction! We insist on perfect order and decent behavior at these, and the past year they were very well attended. The gate receipts about pay the expense of the music and the necessary extra attendants, the profit comes from the hauling to and fro, and the extra traffic comes at a time when other traffic is slack and when it can be handled without extra cars. In addition to these regular dances we give, a few times during the season, 'prize dances,' at which prizes (such as umbrellas, pocket-books, small toilet accessories,

etc.) are given to the best dancers, the award being made either by a committee chosen by the contestants themselves, or by a vote of the spectators, the 'ballot' being the admission ticket for the evening. These prize dances are only given at intervals, as an advertisement and to keep the events from becoming monotonous.

"On every fine Sunday afternoon from 3 to 5 p. m. we give a free concert in one of the buildings. These concerts are either band, orchestral, vocal or a combination of all; in all cases comprising good music by good performers. This has not as yet paid us directly, as the religious element of the town being against it at the start, the attendance has been small; the concerts, however, have proved themselves so unobjectionable—both in matter and in the behavior of those attending—that this opposition is dying out and we will continue them this summer, believing that not only will the attendance increase but that it will be an advertisement for the park, and that it will teach the people to use the cars on Sundays to a greater extent.

"On all other occasions than those noted the park is free to the general public for basket picnics, informal dances, private parties, etc. We tried, during one season, the experiment of making 'non-riders' on the cars pay an admission of 5 cents to the park, but the income from this source was so small, the expense of keeping an entrance-man to collect the admission was so out of proportion to the receipts, and finally, the dissatisfaction at the arrangement was so great that we gave it up, and the only requisite for admission that we require now, is that the person shall be sober and not a disreputable character. We have, this year, under consideration the advisability of charging an admission of 5 cents for bicycles. The facilities for reaching the park on a wheel are so good, and the number of them in use in the city is getting to be so large, that if we do not take some such action, the traffic on the cars—at least the extra traffic caused by the use of the park—will not pay. Of course this would mean that facilities for the safe and sheltered storage of the bicycles must be provided in the park, and this can be done very easily and cheaply in our case, as the buildings are in such shape that bicycle racks may be easily attached to the sides.

"We have provided one end of the dancing hall with a permanent raised platform about 3 ft. high, 12 ft. deep and the full width of the building. This stage has a sheltered outside stairway which leads to some dressing rooms underneath the stage. A few curtains of awning cloth stretched between the pillars at the back and sides and a few light wooden screens, transform this platform into an enclosed stage, and a few home-made footlights and a sliding curtain make it ready for any performance that we or the lessees wish to give. For seats we purchased strong, cheap chairs and settees to seat about 500 persons; these are put on and taken off in a short time through doors in the front of the stage, they being kept under the dancing floor when not in use.

"On days when the park is not leased, light refreshments, soft drinks, ice cream, cigars and fruit are sold in one of the buildings. The privilege is let to an outside party on a commission on profits basis and is fairly profitable in a good season. As in other matters, we insist that everything furnished shall be the best of its kind and sold at the same prices as in the city. This is no hardship to the party



selling, as we furnish free transportation to them and their goods and they are virtually rent-free.

"We have a number of good, strong, safe boats, which we hire at reasonable rates, and in hot weather these are good money producers, but the proximity of a very beautiful river to the heart of the city militates against the free use of the boats, as they are not an 'attraction.'

"We have not yet put in a merry-go-round; principally because we have not had the money to spare; but from our experience with the traveling ones that have been here we think that they are about the best attraction that there is, and shall certainly put one in as soon as we are able to.

"In stage attractions, fireworks, balloon ascensions, water-shows, etc., we have not had a very large experience, and that which we have had has not been favorable to our receipts. Until the usual style of 'attraction' is made more suitable to the purse and the patrons of the average small street railway park, or until we are able to form that 'Amusement League' among ourselves, this company will do little in this line of the so-called 'attractions.'

"From an extended trip among towns of this size, from conversations and correspondence with other superintendents, the writer is of the opinion that it is an easy matter to overdo the amusement business in small parks. The conditions in the larger cities with their congested centers, large floating population, more rapid life and competing attractions, are entirely different, and can be no criterion for the smaller towns, and every manager of a small park that tries to emulate them seems to have come out at the small end of the cash account. We believe that in the smaller towns and cities the best paying park is the one that caters to the social and 'organized bodies' elements, and to the women and children. Such parks do not need to be of very great size; they can be made attractive and kept so at small expense; the capital invested need not be great, and the expense of running should be small. If possible, it should be at a distance from the town—not too far, unless an extra fare for the increased distance can be collected—but so far out that it is not within an easy walking distance from the town. If the town has no river or other body of water within easy reaching distance, the location of the park on such a body of water or the formation of such will be the first and best attraction.

"Our park is not large enough to allow of any athletic grounds or bicycle track, so we concluded to treat it and run it more as an 'assembly grounds,' and to this end have made it as comfortable as possible by good shade, clean, dry, dustless walks, plenty of seats and benches, good toilet facilities and plenty of shelter. We have made it neat and pretty by tasteful buildings, good lawns and plenty of shrubbery and flowers. We take pride in keeping it nice, and find that it pays to do so and that the public appreciates it and aids us in doing so. We allow the fullest and freest use of it in every way and portion, but do not allow it abused. We keep it respectable and find that it pays—and we have just as much of the 'world, flesh and devil' as any town of the same size.

"In our traffic, in the park and the attractions thereat, we have found that it is not wise to be too 'advanced.' The public, as a rule, appreciates more and longer the things that it has reasonably demanded or shown a wish for, and which have been cheerfully and promptly given in response to that wish. They are, after all, only human beings like the rest

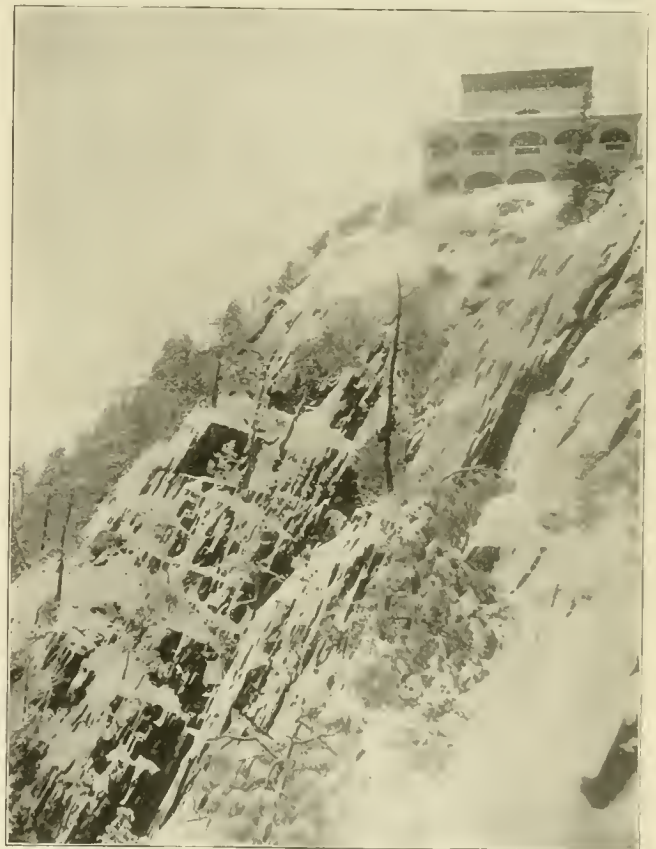
of us, and may be spoiled by stuffing as well as starving! By pursuing a policy based on this belief, we have been able to make a success where the other course would have made a failure, we have been enabled to avail ourselves of the experience—both profitable and unprofitable—of our more radical brethren in the amusement lines, and have still several more cards 'up our sleeve' and an unsatiated public on which to play them."

#### Paducah, Ky.

At Paducah, Ky., the street railway has a park with a theater, boats, bathing facilities, chutes for "shooting," etc., all of which were built by the company; none of these are rented. The admission price to the entertainments is 15 cents, though the entrance to the park is free. Orchestra concerts are given every night. Stock companies with specialty teams have been the most successful, though the company has been fortunate in not having any entertainments which proved failures. There is no attempt made to have organized bodies make use of the park.

#### Holyoke, Mass.

In our issue of July last we described the incline railway running from Mountain Park, near Holyoke, Mass., to the summit of Mt. Tom. The Mt. Tom Railroad, which is leased to the Holyoke Street Railway Company, has proved



MT. TOM PAVILION IN WINTER.

to be a success in every way; last year more than 60,000 people were taken up the incline without an accident of any kind. At the summit is a pavilion 76x92 ft. and two stories

high with a cupola 25x31 ft. The first floor has parlors, dining room, kitchen, etc.; on the second floor is a hall with stage, which will accommodate 500 guests. The cupola is used as an observatory, and from it is to be had one of the most beautiful views to be found anywhere. Mountain Park



VIEW OF MOUNTAIN PARK.

is free to passengers, the fare being 5 cents from Holyoke, and from here the round trip to the summit is 25 cents. At Mountain Park are a gravity railroad, merry-go-round, phonographs, photograph gallery, amusement stage, view towers, etc.; all of these were built by the company and are operated by it, only concessions to caterers being rented. Shows of various kinds have been given; minstrels, educated horses, Japanese troupes, vaudeville entertainments and concerts have proved to be the most attractive. One of the illustrations shows a view of the stage, zoo, pavilion, gravity railway, etc., and another is the summit of Mt. Tom in winter.

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#### St. Paul, Minn.

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The Twin City Rapid Transit Company, of Minneapolis and St. Paul, has had considerable experience with pleasure resorts and the amusement manager, George R. Folds, writes of the company's plans for the coming season and tells of past years. He says:

"For several seasons we have operated two pleasure resorts; one at Lake Harriet, in Minneapolis, and the other at Como Park, in St. Paul. The former place has a large pavilion, amphitheater and floating stage, which we erected on the edge of the lake on property belonging to our public park board. We have had a great many attractions at this place, including such novelties as Gilmore's Band, South Sea Islanders, all kinds of vaudeville artists, comic opera, etc. We have tried free entertainments and at other times have charged admission. Last season we presented 10 weeks of comic opera for which we charged admission of 10, 15 and 25 cents. This, I think, was quite successful; but we have decided to present no attractions at this park this year but will concentrate our efforts at Como Park, St. Paul.

"Como Park lies between the Twin Cities, or nearly so, and it is the purpose of this company to have a new inter-urban line constructed before July 1, which will pass directly through the grounds so that each city will be a feeder for it. At present, we plan to give free band concerts every evening and probably every afternoon during the summer. We may use local bands part of the time

and quite likely shall engage some large foreign band for a period. We are also now considering introducing certain soloists and presenting other novel features to create interest in our program. No admission to the park is charged.

"Como Park is controlled by the St. Paul Park Board and has a good many acres of ground which are kept in very fine shape. It has a large, irregularly shaped lake, upon the shores of which we now have a pavilion to which we are now building a large open air amphitheater. Minnehaha Falls is now in control of the Park Board of this city and several refreshment pavilions are now maintained just outside the park grounds. We have, occasionally, furnished some entertainment there to attract the public, but we find it a very popular resort without spending much energy to make it so.

"In St. Paul, we connect with a suburban electric road which runs out to White Bear Lake, where many picnics go. The company operating this suburban road has quite a park at the lake where it has built a roller coaster, bath houses, a pavilion and a dancing hall, and where it has also laid out athletic fields and made many other attractive improvements. This suburban company advertises and operates this park itself and we get a revenue from all its passengers. I might also add that in both cities we are fortunate in having the base ball parks situated on our lines and some distance from town."

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#### Urbana, Ill.

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How to provide meritorious theatrical attractions at a reasonable price is a problem which managers have in some instances endeavored to solve by forming amusement circuits, whereby better terms could be made with the "teams." B. F. Harris, Jr., president and general manager of the Urbana & Champaign Railway, Gas & Electric Company, is trying to form such a circuit in Illinois and writes us as follows: "A few days since I addressed a letter to about 10 of the roads in the central part of the state suggesting that we get up a little theatrical circuit and employ a theatrical agent in Chicago to get small vaudeville companies for us, so that by giving each company 10 weeks engagement and having the stand one week in each street railway town, we would be relieved of the trouble of getting companies and they would be much cheaper than for single week's engagements. Our idea is to advertise free shows at our amusement park and make the rear half of our theater seats free and reserve the front half for sale at 10 cents each."

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#### Zanesville, O.

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All parks have not been successful; General Manager Westcott, of the Zanesville Railway & Electric Company, writes us that it has abandoned the "Gant Park Theater" for this season. The company is now in the hands of Will Christy, receiver.

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#### Ashland, Ky.

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The pleasure resort of the Ashland & Catlettsburg Street Railway Company, Ashland, Ky., is attractive in both summer and winter, being very popular as a skating resort in winter. The park is known as Clyffeside and admission is free to passengers on the street railway only, 10 cents being





VIEW OF THE LAWN.

charged for others. The features at the park comprise tree boating, free swings, free gymnasium, etc., all being built by the company. The refreshment concessions are let.



SCENES AT CLYFFESIDE, ASHLAND &amp; CATLETTSBURG RAILWAY, ASHLAND, KY.



There are several new attractions in contemplation for the coming season, and in all probability a bowling alley will be built or the theater enlarged. All of these have proved very attractive to visitors. In the way of shows, vaudeville, aquatic and athletic entertainments have been tried, the vaudeville proving the most popular. Band concerts on Sundays and vaudeville on week-day nights are by far the best attractions. No intoxicants are allowed on the grounds and all questionable characters are promptly ejected, police protection being afforded at all times. The pavilion has a seating capacity for 1,000 people. The park contains 25 acres of hill and table land, five acres being a lake; the Chesapeake & Ohio and the Ashland & Catlettsburg Railroads have flag stations at the park gates, thus making the resort a convenient destination for excursions of various associations and societies; the use of the park is extended to such parties free of charge. The car service of the street railway is excellent, cars passing every  $7\frac{1}{2}$  minutes.

#### Binghamton, N. Y.

General Manager Clark, of the Binghamton (N. Y.) Railroad Company, which is the pioneer in the pleasure resort branch of the street railway business, being among the very

first to provide daily concerts and free entertainments for patrons, writes that the company's summer resorts, Ross Park and the Casino, will be conducted much as heretofore except on a much larger scale.

This summer particular attention will be given to excursion and entertainment features. An excursion agent will be appointed by the management and his sole business will be the soliciting and arranging for excursions, both small and large, from the surrounding territory, work which he will take up in conjunction with all the great trunk lines and their branches, either terminating at or passing through this city. Two mammoth excursions have already been arranged for, namely, the Carbondale Knights of Pythias and the Wilkesbarre Brotherhood of Railway Conductors.

At the park the zoo will be made more interesting by the addition of many "happy families" of animals and birds. The pleasure grounds are being improved under the management of the Park Commission, and in hearty co-operation with the aims of the street railroad.

At the Casino croquet grounds and tennis courts will be

laid out as soon as the weather permits. No improvement will be made on the golf links there, because it is believed that golf is a dangerous pastime when played in the pres-



THE LAKE.

ence of such large concourses of spectators and pleasure seekers as will through the grounds each day. The bicycle track and ball grounds will be placed in the best of condition at as early a date as possible, and even now workmen are engaged in clearing the grounds and fixing up the shrubbery.

It is expected to open the resorts to the public about May 30, and to inaugurate the entertainment season of free attractions on Monday, June 20. The daily band concerts will be commenced June 1, and there has already been secured for the respective resorts a large number of high-class vaudeville acts and sensational novelties. The attractions are always selected with great care, as the company caters almost exclusively to ladies and children.

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#### Birmingham, Ala.

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The Birmingham (Ala.) Railway & Electric Company is offering special inducements to churches, Sunday schools, societies and clubs in the matter of picnics and excursions. The general manager, J. B. McClary, has sent us a circular letter from which we take the following data regarding the attractions offered to such bodies:

For picnics there are Hawkins Springs, on the Bessemer division; Avondale, at the terminus of the Avondale & Fountain Heights electric line; Ensley Bridge, on the Ensley division, and East Lake. Hawkins Spring Park is seven miles from Birmingham and six miles from Bessemer. The spring is the largest and deepest in the county. The company has just completed a pavilion, to afford shelter in case of rain and to accommodate clubs wishing to dance. In addition to the points mentioned another park, Pleasant Valley Park, on the Powderly line, can be had on application to the owner.

For the accommodation of trolley parties and excursions the company has the "Royal Red" illuminated car and the "Electra," an open car of especially large capacity. The rates are as follows: For Sunday schools, societies and clubs, the rate to Hawkins Springs and Ensley Bridge is 10 cents for the round trip; East Lake and Avondale can be reached, if as many as 50 or more go in a body, for 5 cents round trip. These rates are from Birmingham. Satisfactory rates are named from East Lake, Pratt City or other suburban cities upon application. The trolley cars, "Royal Red" and "Electra," can be had for \$15 for three hours. A reduction is made in the price of these cars where churches rent them in order to raise funds.

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#### New Bedford, Mass.

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The Dartmouth & Westport Street Railway owns and operates Lincoln Park, located between the cities of New Bedford and Fall River, Mass., at which are a theater and casino, merry-go-round, toboggan slide and Ferris wheel; the theater and casino were built by the company. Admission is free to all persons and band concerts on afternoons and Sunday evenings, with free dancing afternoons and evenings, are the chief attractions. The management states that vaudeville shows are the most successful. Concessions are sold to various parties, such as the catering, merry-go-round, toboggan slide and Ferris wheel. The public appears never to tire of dancing and music.

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#### New Haven, Conn.

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The Winchester Avenue Railroad, of New Haven, Conn., has at West Haven a park where a merry-go-round, dancing pavilion, maze, bowling alleys, swings, shooting galleries and a number of smaller affairs are among the attractions; all these are let to one person who sub-lets to others. The company has erected an electric fountain and gives exhibitions of fire works once a week. For music an orchestra of 12 pieces is provided which gives concerts of 2½ hours in the afternoon and 3 hours in the evening. Efforts are made to have the annual gatherings of organized bodies held at the park. As to what the experience of the company has been, General Manager Kelsey says that first-class, clean vaudeville shows have proved to be the best (at these the only charge is 5 cents for a seat) and large band concerts and big hippodrome shows have been failures: he makes the following suggestions: "Make people think they are getting something for nothing; have nothing but what is clean and the best of its kind; evening attractions such as illuminations and fire works draw best; give people plenty of outdoor seats and good music, and keep everything neat and clean."

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#### Norwich, Conn.

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At the park of the Norwich (Conn.) Street Railway Company there are a theater, bicycle track, bowling alley and merry-go-round; the theater was built by the company. This year music for dancing in the afternoons and evenings, and band concerts on Wednesday and Sunday nights are among the principal attractions. Five cents is charged for non-passengers. The concessions for catering are sold to different parties; liquors are not permitted, however. Variety shows lasting about 1½ hours have been found to be the most successful; any shows that do not last more than one hour have proved failures. Superintendent Adams states that arrangements are made for the annual outings of organized bodies and that the company usually has the G. A. R. gatherings, church and Sunday school picnics and the Labor Day meetings.

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#### Westfield, Mass.

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The Woronoco Street Railway Company, at Westfield, Mass., has a park where concessions for a trotting park, photograph gallery, phonographs, etc., are rented to various parties. In fitting up the park the company itself built cages for small animals, seats, swings, etc., and the theater. Admission is free to all. Band and orchestra concerts are given on Thursdays and Sundays. Superintendent Townsend writes that one of the best features was the amateur night once a week, when the best amateur was given a cheap watch, three judges being chosen by the spectators to award the prize. In arranging the variety programs an effort was made to get the largest variety of talent that could be found, but not more than \$75 or \$100 per week was spent for this. Musical teams were secured for Sundays. The experience of the company has been that the proper advertising of the park is extremely important and must be carefully looked after to make the enterprise a success.



## Hot Springs, Ark.

At Hot Springs, Ark., the conditions are different from those at most places, the population being largely made up from visitors from all parts of the world; these visitors must be entertained and for them it is necessary to have first-class and varied amusements. Whittington Park is the property of the Hot Springs Street Railroad Company, and is a tract of 40 acres located in a spur of the Ozark Mountains some two miles out from the city. It is beautifully located and improved; there is a lake fed by springs and stocked with game fish; on the lake are pleasure boats and bathing booths. There is a quarter-mile bicycle track and a base ball field where the league clubs train during the winter and spring. In one of the views of the park is shown Corbett's

which requires that an admission fee be charged: the attractions on Sundays are colored baptizing, Salvation Army meetings, revivals, etc., which draw large crowds. Also for church entertainments and Sunday school picnics the use of the park is given free. No liquor is sold on the grounds but there is a good club house directly across the road so that none need go thirsty. The general manager of the road, C. G. Convers, to whom we are indebted for the illustrations showing the park, states that the park has been a source of large revenue to the company as well as a convenience greatly appreciated by the public, and is of the opinion that any street railway company that neglects to have such a place of amusement at its terminal is missing a good thing. One of the illustrations shows "Sinkiller" Jones baptizing some of the faithful at the park.



SCENES AT WHITTINGTON PARK, HOT SPRINGS, ARK.

ring where it was expected that he would meet Fitzsimmons. Though the fight was not pulled off there the ring remains and is still used; the last fight was in March when Kid McCoy knocked Burley out in the third round. The park is supported by the commissions or gate receipts; the refreshment privileges are leased. The following is an example of one of the week-day entertainments:

1. One-fourth mile donkey race.
  2. 300-yard running, hurdle race.
  3. Half-mile bicycle race.
  4. Quarter-mile bicycle race, boys under 10.
  5. Pie-eating contest by the Jolly Coons.
  6. Climbing greasy pole.
  7. Diving in flour pans by the Jolly Coons.
  8. One-fourth mile running race, open to all.
- Suitable present will be given for each event.  
Dive from 100-ft. tower into 36 in. of water, by Master Raymond.  
Admission, 25 cents.

On Sunday it is endeavored to have nothing at the park

## Los Angeles, Cal.

The Los Angeles Railway Company has no park of its own but provides band concerts at the public park upon its lines every Sunday, and also such attractions as balloon ascensions, high dives, etc., occasionally. The greatest fête in this city is a carnival of a week's duration called "La Festa di Los Angeles," which is always a week of prosperity.

## Kankakee, Ill.

The Kankakee (Ill.) Electric Railway Company has a park where a theater, dancing pavilion, merry-go-round, and swimming and boating facilities are the attractions; all of these were built by the company. The theater and the

refreshment concessions are rented. Vaudeville shows have proved the best attractions at the theater.

#### Davenport, Ia.

At Davenport, Ia., the street railway pleasure resort is let, all the attractions going to the lessee with the park; admission is free to all. The company has built the following: "Chutes," dancing pavilion, rifle range, summer theater, museum, bowling alley and electric fountain. This year new features are to be added, including band concerts, summer opera, cinematograph, etc. A brass band of 15 pieces renders concerts in the afternoon and evening, three days per week, Sunday, Tuesday and Friday. A merry-go-round is also one of the attractions. As to the best shows, General Manager Lardner reports that band concerts draw best on week days and sensational shows attract large numbers of the working people on Sunday. The bowling alley has proved a failure; it is too hot work when there is no beer. Also the expensive theatrical companies are too costly for small towns; cheaper attractions given free pay the best. There are to be a number of annual gatherings of organized bodies which will be held at this park: among the most important of these are the "National Saengerfest" in July and the Union Veterans' meeting in August.

#### Tampa, Fla.

The Consumers' Electric Light & Street Railroad Company and Tampa Suburban Railroad Company, of Tampa, Fla., have two resorts, one of which is leased by the year, at which are pavilions, halls, boat houses, bicycle track, etc. Admission to the parks is free and concerts are among the best attractions. For this season the foot cycle is under consideration as a new feature. General Manager Musing in speaking of the park amusements says: "The greater part of our population being Cubans and Spaniards, we are compelled to cater to them to a certain extent, and therefore we have a variety of sports beside the regulation ones. We also have a pavilion for colored people, located on the Hillsborough river near our water power plant."

#### Grand Rapids, Mich.

The Consolidated Street Railway Company, of Grand Rapids, Mich., has maintained a pavilion at Reed's Lake, about four miles from town, for 10 or 12 years. At the

beginning the only attraction, aside from groves, swings, the lake and the boats, consisted of a military brass band. This was considered sufficient until the last few seasons, when, to draw more people, the company commenced to give small auxiliary entertainments such as a special cornetist or a sketch team, making one short performance in the afternoon and another in the evening.

The demands of the public had outgrown all these, however, as well as the various pavilion buildings erected from time to time, and accordingly last year, when the old pavilion was destroyed by fire, the company constructed a new one, having an available floor space for guests of 30,000 sq. ft., with stage, dressing rooms, orchestra pit and other theatrical adjuncts.

Up to this time the music and specialties had been paid for out of the increased number of car fares, but it is now



LAKESIDE CLUB, GRAND RAPIDS, MICH.

believed there is a better way to both satisfy the public as to more elaborate entertainments and to save a large proportion, if not all, of the cost of the entertainment, by providing opera chairs, and charging a small fee for reserving them for patrons. With this in view several hundred chairs have been placed in the center of the pavilion and directly in front of the stage. The seating is arranged on an incline plane and the chairs are so placed as to leave room for the waiters of the privilege man to pass through the audience, during intermissions, and supply the people with soda water, confections and other refreshments.

Frank Burt, a practical theatrical man and manager of the Lake Erie Park Casino, of Toledo, has booked several companies of players for the Grand Rapids pavilion. Hereafter, instead of short entertainments and long intermissions, there will be longer entertainments and shorter intermissions. A large amount of scenery has been secured and provision made for attractive stage settings. Outside the pavilion a good many other attractions are being secured. Enough tent shows and booths have already been contracted for to make a respectable "Midway."

One of the illustrations is a view of "The Ramona" pavilion, showing the front and side of the building, and another is a view of the "Lakeside Club" house. The latter building is the property of the street railway company, but is leased to a private club having about 900 members. This arrangement is found to make the resort very popular with all



"RAMONA" PAVILION.



classes of people and materially adds to the company's receipts.

G. S. Johnson, president and general manager of the Consolidated Company, is a firm believer in summer resorts as a source of income, and the increased popularity which each succeeding year has brought proves the success of his policy.

## Lake Geneva, N. Y.

No part of the world has been more favored by nature than New York, and for beautiful scenery the central-western lake region holds its own with any other portion of the state. Through this beautiful region runs the Geneva, Waterloo, Seneca Falls & Cayuga Lake line, connecting the towns of Cayuga and Geneva at the northern ends of the lakes of those names. Lake Cayuga Park is the pleasure resort of the company and comprises 50 acres, to which admission is free. A theater, bath houses, boats, merry-go-rounds, swings and a pier running into the lake for 600 ft. are among the attractions to furnish amusement. The catering and carousal privileges are rented. At this park the paying features have been balloon ascensions, fireworks, illuminations and out-door attractions, and the theater has proved a failure, though W. C. Gray, general manager, writes us that all kinds of shows have been tried. He states that the best drawing card last year was what they called a "Night in Japan," when the grove was decorated with some 3,000 lanterns.

## Bangor, Me.

The Bangor, Hampden & Winterport Railway Company at a recent meeting decided to establish a park on the river shore just north of the Gen. Butler homestead, four miles from town. The park will have 800 ft. of water front and be known as Riverside; the attractions will include a theater, tennis and ball grounds, golf links, etc.

## Exeter, N. H.

The Exeter (N. H.) Street Railway Company is planning for a commodious and very attractive casino at its Hampton Beach terminus which will contain a theater with a seating capacity for 1,000 persons, a large dining room, nearly 100 bath dressing rooms, bowling alleys, billiard hall, etc., which promises to make the Beach increasingly popular as a summer resort.

## Oshkosh, Wis.

The Citizens' Traction Company, of Oshkosh, Wis., has invested between \$3,500 and \$4,000 in a 20-acre tract a few miles from the city where a summer park will be established.

## Muskegon, Mich.

The Muskegon (Mich.) Railway Company is another which contemplates engaging in the theatrical business this summer, and will build a large summer theater on the lake front at Lake Michigan Park. One pavilion at the park is to be reserved for dancing. The company has ordered four open cars of Jackson & Sharp to help care for the summer traffic.

## Saginaw, Mich.

At Saginaw, Mich., the Union Street Railway Company has enclosed a portion of Riverside Park and will operate it as a pleasure resort. The remainder of the park will be free to the public. New buildings are to be erected, a loop put in whereby passengers will be dropped on one side and taken up on the other, and a first-class vaudeville show will be conducted on the grounds every afternoon and evening during the season.

## Brooklyn, N. Y.

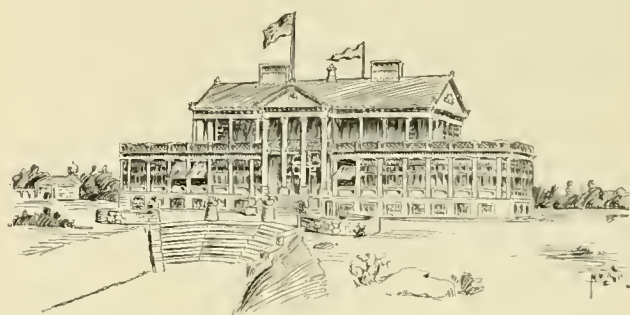
The Nassau Electric Railroad, of Brooklyn, is making elaborate preparations for the coming season. A cycle track and base ball grounds are being built near the West End depot, Coney Island. The tracks will be moved to the west about 300 ft. so that a clear space 750 by 400 ft. will be obtained. In addition to this an arcade is to be constructed from the depot to Surf avenue, a distance of 200 ft. It will afford thousands of visitors shelter from rain and storm, and privileges will be rented out on each side.

## Charleston, S. C.

The City Railway Company, of Charleston, S. C., has leased all the privileges at its Chicora Park; a restaurant has been built and a number of pleasure boats put on the river. The shooting gallery, bowling alley, pool and billiard rooms, ice cream booths, are all open for the summer, and every effort will be made to make Chicora a leading pleasure resort for the city folk.

## Portland, Me.

The Portland (Me.) & Cape Elizabeth Railway Company, of which H. R. McLeod is general manager, will have a pleasure resort this year of unusual beauty and attractiveness. The company has purchased the Cape Cottage hotel



CAPE COTTAGE CASINO.

property comprising 15 acres. It is on a high and rocky bluff overlooking the entrance to the main channel to Portland harbor and is famous as being one of the most picturesque spots on the New England coast. The large casino, now nearing completion, will afford every facility for the comfort and entertainment of the patrons of the road. The refreshment hall and the balconies, enclosed with glass, have a seating capacity of 400. Over the balconies is a promenade, which affords a fine view of the numerous islands in Casco bay. On the top floor is a large hall for entertainments and dancing, while the billiard room is in the base-

ment. The kitchen is also in the basement. The flight of steps, which may be seen in the cut, leads down to a lower terrace which slopes to the sea beach, a few hundred feet away.

#### La Fayette, Ind.

The street railway at LaFayette, Ind., was a horse road from the Public Square to the northwestern part of the city with branches to the railroad stations, and was built in 1884. In 1887 the motive power was changed to electricity and an extension of a mile and a half to Purdue University in West LaFayette, on the west side of the Wabash river, built. In 1891 the company was reorganized and extensive additions made to the rolling stock and power house equipment; new tracks were laid forming loops, one on the west side of the river circling the campus of Purdue University, and one in the southeastern part of the city. The new lines furnished ready transportation to these districts and made them very desirable for residences, greatly appreciating the value of the property. A trip around the two loops also proved to be a most agreeable one in hot weather and pleasure riding became a feature of the Sunday and evening traffic.

The most recent extension to the line was completed in 1897 and is a line along the river bluff and through a picturesque valley known as Happy Hollow to the Soldiers' Home and Tecumseh Trail, some five miles north of the city.

Tecumseh Trail is as romantic a spot as is to be found in the Hoosier state. The name is particularly applied to a heavily timbered tract of about 20 acres, lying on the bluff, which at this point is at the river's edge. Along the river is yet to be plainly discerned the beaten path along which Indians for generations made their way. Not far above the Trail is Prophet's Rock, from which the Prophet, the wise and wary brother of Tecumseh, chief of the Shawnees, predicted success for them in that campaign which ended in the battle of Tippecanoe in 1811; the battle field is just beyond Prophet's Rock.

Back of Tecumseh Trail on the higher ground is the Soldiers' Home, where are domiciled, according to the season, from 500 to 1,000 veterans of the rebellion. The Trail was the discovery, so to speak, of Col. Richard P. De Hart, who some twelve years ago made his summer home there and improved the place by building rustic bridges, wigwams and log cabins, which last he filled with relics of the Indians and of his own military career. The latch string was always out and many were the parties which partook of the colonel's hospitality, he always proving a most desirable addition at any merry making. When the Home was located, Col. De Hart made a gift to it of a strip 1,000 ft. wide off the southern end of the Trail for an entrance way to the river, and disposed of the remaining tract to the LaFayette Street Railway Company.

The company last summer built a pavilion 40x60 ft. and has now just completed a hotel and theater building which is 50x75 ft., two stories high, with broad balconies on three sides. This building has been leased to George L. Malcus, who will provide the theatrical and musical entertainments. Bathing, boating and fishing are also among the attractions offered.

The superintendent of the company, E. B. Gunn, has thoroughly overhauled the old equipment and purchased some new cars in preparation for the summer traffic.

#### Aurora, Ill.

The Aurora & Geneva Railway Company has made arrangements for a park of 50 acres, to be known as the Mill Creek Park, comprising some of the most picturesque country in the Fox river valley. A pavilion is to be erected, golf links, ball grounds, etc., provided, and it is hoped to have the park open to the public by June first. This park is about half-way between Aurora and Batavia.

#### Waverly, N. Y.

The Waverly, Sayre & Athens Traction Company, of which A. N. Broadhead is president, has a trolley-party car which, among its other attractions, has an orchestrian, thus always having music at hand. This idea is one which might be widely copied with great success.

### A NEW FENDER TESTED.

The accompanying cut shows a fender recently patented by T. H. Campbell and subjected to a number of tests. On the back of the fender is a transverse shaft resting on two hangers secured to the underside of the platform. In front of the fender is a rotating buffer padded with rubber and having two sprocket wheels, one at each end. Endless chains connect these two sprockets on the shaft at the rear



CAMPBELL FENDER.

of the fender. The power is derived from the car axle. On the platform is a tripping device consisting of a dog and plate which is connected to a rod passing back under the car to sliding bearings. When the motorman presses this plate with his foot the fender drops within an inch of the track and the buffer begins to revolve. The fender is ordinarily carried about 6 inches from the track, but can be lifted up against the dash. Dummies have been placed on the track and the fender has picked them up when the car was going 12 miles an hour.



## MINORITY OF PROPERTY OWNERS CAN NOT ENJOIN.

In the REVIEW for April we briefly noted the decision in the case of Shaff and others against the Cleveland, Medina & Southern Electric Railway Company, wherein the plaintiffs, a minority of the abutting owners, sought to prevent the building of the road. Since that issue we have received the text of the opinions in the Court of Common Pleas and in the Circuit Court, where it was taken on appeal; though these are inferior courts the discussion of the principles upon which the decisions are based is of interest to those engaged in building interurban lines.

### IN THE COURT OF COMMON PLEAS.

The case of Michael Schaff and 21 other plaintiffs against the Cleveland, Medina & Southern Electric Railway Company and Joseph Davis, is an actin brought to enjoin the defendant railway company from constructing an electric railway along what is commonly known as the Wooster Pike, a public highway dedicated to public use, and running southeasterly through this county to Medina and Wooster.

It sufficiently appears that the defendant company is duly incorporated and engaged in constructing an electric street railway, along the road I have named, passing through the county districts, the townships and villages between Cleveland and Wooster. It appears also that the county commissioners have granted to this company, so far as they have power to grant, the right-of-way over this highway. It appears, too, that consents have been obtained from a majority of the abutting property owners along this highway; so that so far as the company is concerned, it appears to have taken the necessary steps to entitle it to construct and operate the railroad.

The plaintiffs upon filing their petition obtained a restraining order of this court, and in their petition they allege that in the construction of this railroad they would be injured in their right of ingress and egress of the property abutting along said highway; that the style of construction proposed would seriously interfere with their property rights; that it is, in effect, the taking of their property under such conditions that this company ought to be required to make appropriation before taking possession of the highway, and constructing its tracks along the same.

The complaint which is made, while it varies a little in the affidavits of the different property owners, in the main is not essentially different; they say that the erection of this line on the westerly side of this street would be to seriously affect the value of the property abutting thereon; that it interferes with the hitching of teams in front of their respective properties, that the noise incident to the operation of the cars, and the dust created by the cars running over the line will seriously affect the value of the property. These in the main are the things which they say will cause their damage.

Some general propositions have been announced in a street railway case that I think are applicable in this case. The mere erection of poles for the purpose of an electric street railway, does not, in the judgment of the courts of Ohio, and has not in any case of which I have knowledge, been regarded as constituting an additional burden on the street. For it is the holding of the courts that the operating of a street railway along a public highway is a right consistent with the general uses for which the street is dedicated. The application of electricity as a motive in the operation of cars is regarded as a power properly applicable to street cars over a public highway.

When this case was presented to me I was interested in examining the question with a view of considering whether there was any difference in principal between the use of a country road and a city street. The fee of the land of a country road is in the abutting property owners; the fee of the land in the cities is in the city. Now is there any difference when it comes to the question as to how the street may be used. I think Judge Ranney has made that reasonably clear in the Cummins case reported in the 14 Ohio State Reports at page 524; after speaking of the uses

to which a street may be put, he says: "But while our decisions have been thus liberal, in allowing the general assembly the largest discretion in the management and control of easements acquired for public highways, we have been very careful to say, in the case to which reference has been made, as well as upon other occasions, that they would not be diverted to other purposes than those for which they were acquired; nor enlarged so as to accumulate additional burdens upon the land, or destroy or impair the incidental rights of the owner, appurtenant to his land located upon the street or highway. The distinction lies between those things which fairly belong to the grant, and those which are reserved to the owner, or by law, attach as incidents to his property. For this purpose, there is no occasion to distinguish between lands acquired for ordinary highways, leaving the fee in the owner, and lands dedicated for streets in town, where the fee vests in the municipal corporation in trust to answer the purposes of the use. In either case, the interest acquired and used by the public at large, is an easement, of a definite character and held for the attainment of objects known; and in either case, 'distinct from the right of the public to use the street, is the right and interest of the owners of lots adjacent.'"

It would seem from the quotation that the judge sees no distinction between a country road and a city street when we come to consider the uses to which it may be put.

I have looked over the affidavits in this case and I conclude from the general character of the statements made by the abutting property owners that the matters of which they complain are not of such character as would justify the court in believing that the construction of this road in a general way, under the authorities I have examined, would constitute an additional burden on the street. In other words, I do not think there is a showing here that would justify the court in granting an injunction or in holding that the construction of this road along this street will interfere at all with the reasonable and ordinary use of the street. The road is to be constructed along the westerly side of the street, not in the center of the street and I don't think there may be special instances where there may arise some little inconvenience to abutting property owners in the use of the street. This road is to be laid along near the gutter on the westerly side of the street, with its east rail 16 ft. west of the west side of the brick pavement; that leaves a sidewalk space of about 8 ft. between the westerly rail of the said line and the west side line of the street for the use of pedestrians. The only difficulty that might arise is in certain instances where possibly some business may be carried on, for instance a blacksmith shop where the farmers are accustomed to hitch their teams along the side of the street it would in some manner interfere with them in that regard, but that would be exceptional rather than general. And many of these complaints or at least some of them to which objection is made as constituting an injury—contemplated injury, I think it is plain that in a measure they are fanciful and imaginary rather than real, such as the flying of dust, the blowing of a whistle or the ringing of a bell.

There may be individual cases where the grading of the street may affect injuriously an abutting land owner, and interfere with the ingress and egress to his premises, no such case is made here, and where such a case arises, he will have an adequate remedy at law. It seems to the court from the facts before us that we would not be justified in granting an injunction preventing the construction of this road. The injunction is refused and the petition dismissed.

### IN THE CIRCUIT COURT.

We have been examining this case up to within a very few minutes and have formulated no opinion and shall deliver none, but simply announce the conclusion which we have reached.

The rights of a street railroad to occupy a portion of a highway—whether a street or a public highway, in the country, is quite definitely settled by the Cummins case, and it seems to be thoroughly settled everywhere, that a street railroad located in a highway, in a public highway, is but one mode of travel or transportation upon that highway and if that is all that appears, it imposes no additional burden upon the lot-owner for he is entitled to compensation whether he owns the fee to the center of the street or whether the title of the high-

way or the street is in the public ether, and if the occupancy of the street is a lawful one, then the lot-owner must bear any incidental burden incident to that lawful occupancy of the street. The running of a line of omnibuses upon the street or highway might be some inconvenience to the lot-owner, but he would not thereby be entitled to an injunction to prevent the use in that way. But when the location of the street railroad upon the highway appropriates any substantial property rights of the lot-owner, then the lot-owner is entitled to an injunction to prevent the appropriation of the property right until it has been appropriated in the manner pointed out by the constitution and the statutes.

And it comes to a question of fact, whether the case before us, under the proof, under the testimony upon which the case has been submitted, establishes with such certainty the facts that property rights have been invaded here, as will entitle the plaintiff to an injunction; and we have examined, with a view of solving this proposition, a number of cases that I will read from or comment upon other than to say we have examined the following cases:

35 Minnesota, 112.

27 Wisconsin, 194. That is a case in which the complaint was that the track of the street railroad was so laid as to interfere with the occupancy of a store, by allowing drays to be backed up to the door, and the court held in substance, that the occupancy of a street is not one of easement the lot-owner is entitled to.

50 New York, 206. If we blot out the distinction that is there made in New York between the rights of the lot owner who owns to the center of the street and those only who own the margin of the street, then that case is quite pointed in sustaining the rights of the company. In that case, road property was interfered with. It was alleged that the railroad track ran so near the lot—the owner's lot, as to prevent his driving his carriage up to his sidewalk to a curb, and the court there held that as the title of the street was in the public, the petition with those allegations made no cause of action for an injunction. And so far as we have been able to find, New York is the only state that draws the line between the lot owners—the easement which the lot owner has in the street where he owns to the center or to the margin.

35 California, 325.

3 Philadelphia, 259.

125 Massachusetts, 515.

79 Maine, 363.

91 New York, 145.

All have more or less bearing upon this question, and in none of them under the facts of those cases was it held that the complainant was entitled to an injunction.

We have reached the conclusion that the facts established by the affidavit upon which the case has been submitted, do not so clearly establish the fact that property rights have been invaded here as to entitle the parties to an injunction. We would not hold if it clearly appeared that property rights were being invaded and appropriated here that were protected under the constitution, that an injunction would not lie because the party had a complete remedy at law. Clearly it would be, under these facts, entitled to an injunction. And we refrain from commenting upon the facts, because the ultimate rights of these parties must be settled in a claim for damages. The road, of course, going through, an injunction would be only a temporary expedient to stop it until settlements were made. The ultimate rights of the parties are to be settled in money compensation; the road is to be built, and if these parties are entitled to compensation, they must get it in the way of damages.

And, in view of the doubt we have under proof, we simply say that we think the injunction should be dissolved and leave the parties to any other remedy that they may have; and that will be the order.

The North Chicago Street Railroad Company has decided to issue stock to the extent of \$1,320,000, which is 20 per cent of the stock now outstanding; the proceeds are to be used to take up bonds and pay the floating debt incurred by building new track and changing the motive power.

## PARIS TRAMWAY PLANS.

The city of Paris is about to undertake the construction of a system of tramways, the development being along the second of the lines pointed out by the Massachusetts committee, viz., municipal ownership of the tracks and private operation. The law authorizing the undertaking has been promulgated and the terms of the agreement made last year with General Traction Company made public. This company undertakes to form a special company to operate the lines when constructed, with a capital of not less than 25,000,000 francs (\$5,000,000). The total length of the system is 40 miles, but only 25 miles is at present contemplated, and this the city only undertakes to construct in eight years, which would appear to be ample time.

Some of the details of the agreement with the city are given below. The amount of the loan to be raised for the execution of the first portion of the lines is 165,000,000 francs (\$33,000,000). The company which has obtained the working concession undertakes to employ only Frenchmen, and to have all its plant and rolling stock made in France. The board of directors of the working company must be exclusively French; the company will be permitted to have its depots and works outside the city, but it must pay the octroi duties on the materials employed, as if the buildings were within the city walls; the names of the stations must be of a uniform color, and must be so placed that they may not be confounded with advertisements; the minimum wages or salary to be paid to any of the company's servants or employes will be 150 francs per month, or for workmen engaged temporarily 5 francs per day; the wages must be paid in full during the period of military instruction; the day's employment must not exceed 10 hours, with a whole day or two half days rest weekly, and 10 days' holiday annually without deduction of wages; in case of sickness wages must be paid in full for at least a year; in case of accident, until complete recovery, without prejudice to the indemnity to be paid if permanently disabled, wholly or partially.

The fares are fixed at 25 centimes (5 cents) first class and 15 centimes (3 cents) second class for any distance. Passengers before 9 in the morning may have for 20 centimes (4 cents) a return ticket, available at any hour in the day. Children of the municipal schools are to pay a fare of 5 centimes (1 cent) only when traveling collectively, accompanied by a master. The working company will pay to the city for the use of the lines 10 centimes (2 cents) per first-class passenger, and 5 centimes (1 cent) second class, increased progressively should the number of passengers carried during the year exceed 140,000,000. Children traveling for 5 centimes are not to be taken into account for the payment or the number. The stations and means of access to the platforms to be at the charge of the company, but the platforms are comprised in the work executed by the municipality. The concession is for 35 years, but the city reserves a right of purchase from the year 1910.

An attempt was recently made to wreck a Cleveland suburban car by four men who rolled a section of cast iron water pipe between the rails about 2 a. m., at which hour the cars run at a high speed; a resident of the neighborhood, seeing what they were doing, forced them to remove the pipe.



## CORRESPONDENCE.

MONTREAL STREET RAILWAY COMPANY.

Montreal, April 29, 1898.

EDITOR STREET RAILWAY REVIEW:

I notice in your issue of April 15, under the heading of "Tea-pot fare collections unpopular," an attack on the fare box system of collecting fares. The article is evidently written by one who is not familiar with his subject and the same can be said of the article in the Saginaw paper. The system is neither cumbersome nor undignified, nor is it repugnant to any one except dishonest conductors, who like to feel the jingle of the coin in their pocket, as they know a good percentage of the fares will remain there at the end of the day.

Your statement that it is a good opportunity to work off bad money is too absurd to dwell on, except a road employs conductors that are "blind in one eye and can't see out of the other." It might be well before writing articles of this sort to secure a box from us and see how it is worked, or give intelligent investigation to the subject.

The fare box is the only business like way of collecting fares there is at the present time, and they are used on a great many more roads than you are evidently aware of, and I defy you to find any intelligent manager in the country who has studied the fare box who will not back this statement up.

My time is too limited to discuss the disadvantages of the fare registers as compared with the boxes, but I have yet to meet the man who has studied the question who will say that the registers are better than the boxes. As for the public objecting to putting fares in the boxes, I cannot understand this, as it is only a question of putting a fare into a clean box or into a (very often) dirty hand. According to Saginaw ideas the kickers had better put their church collection into the elder's pockets and not on the plate the next time they go to church, in case they mistake the elder for the monkey attachment to the church organ.

W. G. Ross, Comptroller.

EDITOR REVIEW: With reference to your letter of the 24th of March, offering to send a copy of your book "Street Railway Law," I have to inform you that I already have a copy, but will be pleased if you will send me another for the use of our lawyer, for which I enclose herewith \$1.

With reference to this book, I might inform you that we had a case a short time since in which a cart driver a little ahead of one of our cars looked behind him and then deliberately drove across the track in front of the car, with rather surprising results to himself and vehicle. We defended his action and cited five or six similar cases from your book where judgments have been in favor of the company, and two similar cases in England. The judge, however, decided that he was not going to be guided either by American or English law and gave judgment against us; unfortunately we cannot appeal the case, the amount claimed being too small.

Circuit court cases in this country are not reported and consequently it is impossible to refer to previous decisions with reference to actions of this description.

EDWARD A. EVANS,  
Manager Quebec District Tramway.

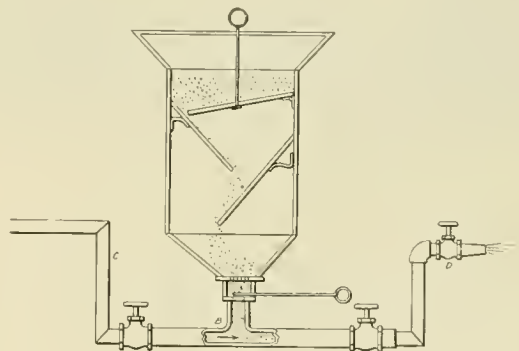
In response to the request for a reliable safety brake for long grades, published in our last issue, Patrick Flood, of the mechanical department of the Albany Railway Company, writes us concerning the emergency brake of his invention, with which 75 cars on that road are equipped; he also states that he has recently closed a contract for equipping all the cars of the Cohoes City Electric Railway.

The Kingsland Manufacturing Company, of St. Louis, writes concerning the same matter and states that it is about to place on the market a brake designed for severe service in which it is claimed: There are no shoes on the wheel. There is no slack in the chain, so commonly provided for curves. There are no equalizers or brake beams. The motorman need exert but one pound pressure to control the car where he now exerts four. Friction is put upon the axle, and controlled by a lever instead of the staff and crank or wheel. The lever occupies very little room on the platform and is readily changed from one end to the other. There is no chain to wind up and the car does not have to be in motion to set the brakes.

## A HOME-MADE SAND BLAST.

A sand blast can be used for effective service in the railway shop in cleaning slag and corrosive matter from parts. The fine, sharp particles of sand cut like diamonds and will remove rust, gummed oil spots, surface irregularities, nicks and the like from metal. Initial letters can be cut on plate glass by covering that part of the glass not desired to reach by thick, hard paper or gelatine board. Name plates can be cut the same way. Stencil letters will be required, the sand blast cutting the exposed parts.

Of the various types of sand blasts, the writer has obtained most effective service from the one illustrated, which



is unpatented, and which can be made by almost any machinist. In this device, a hose is connected with the air supply and the air blast governed by a check valve. The sand is in the retort, and the grains fall through the outlet at the bottom, meeting the blast of air at B and are sent to the nozzle D, with great force. The retort is tin and the pipes and connections can be bought at any dealers. A common brass or copper nozzle, about  $\frac{5}{8}$ -in. inlet, is used. Crushed quartz makes the best sand. The air blast is obtained from a blower or from a compressed air chamber which is connected to the pipe C. F.

## POWER STATION OF THE SOUTH SIDE ELEVATED RAILROAD.

The adoption of the Sprague multi-unit system by the South Side Elevated Railroad Company, of Chicago, excited much interest among those connected with electric railways, and it has been generally recognized as a step in advance. The reputation of the men back of the plan and the acceptance of it by President Carter and General Manager Hopkins, men of wide experience in railway affairs, lead many to have much faith in the system. After a consid-

ing engineers for the company, and is a model of convenience, embodying the latest engineering improvements. The location of the station is at the corner of State and 40th streets, alongside the Lake Shore & Michigan Southern Railroad. Besides having excellent coal facilities the station is situated near the center of current distribution. Fig. 1 shows an electric train passing around the curve from 40th street, the power station being to the right in the picture.

The station is divided lengthwise into two large rooms as shown in the plan and section. The building is 200 ft. long; the engine room is 59 ft., and the boiler room 48 ft.

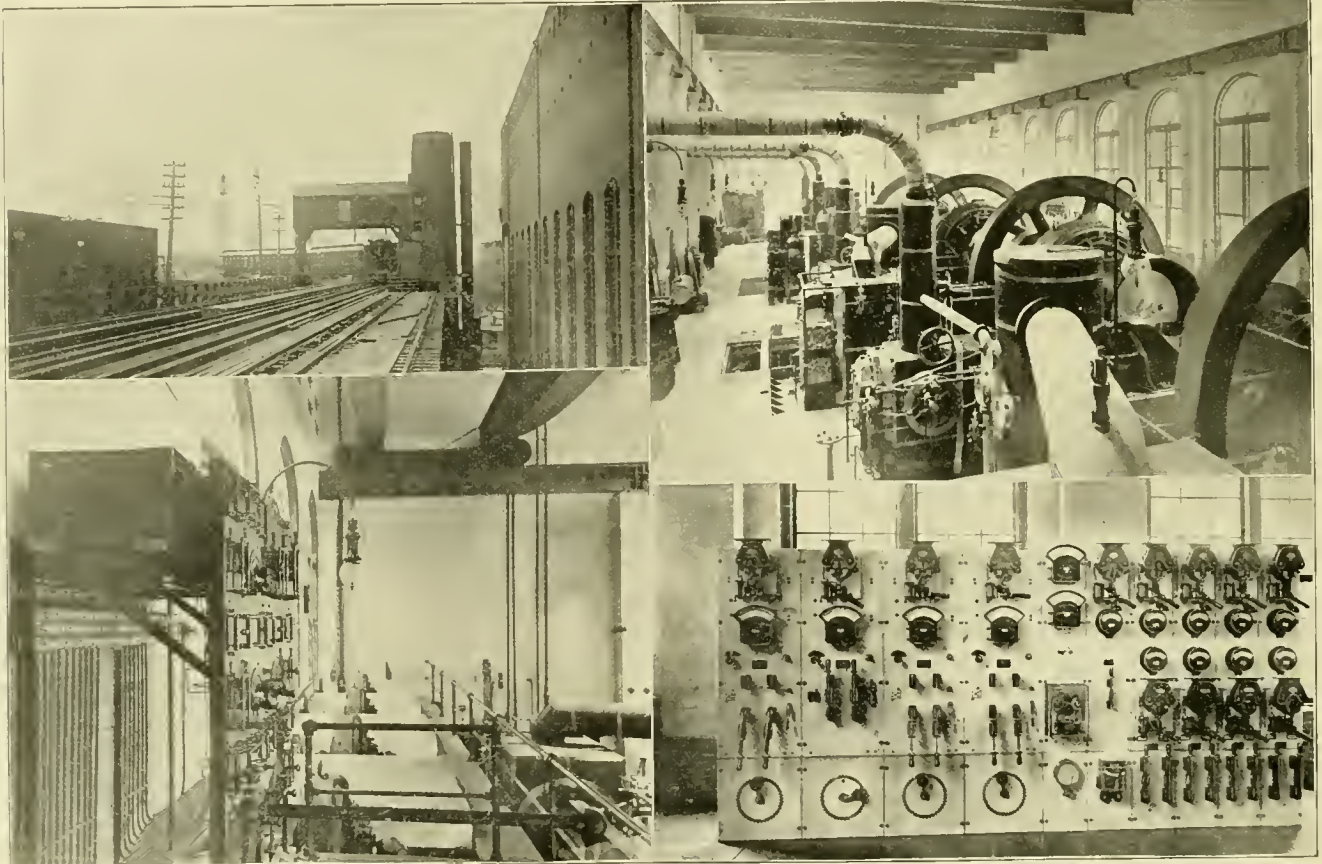


FIG. 1.—A MULTI-UNIT TRAIN.

FIG. 3.—FAN MOTORS AND SWITCHBOARD.

FIG. 2.—ENGINE AND GENERATOR ROOM.

FIG. 4.—MAIN SWITCHBOARD.

erable delay, most of it being occasioned by the power station, electrically equipped trains are now running and the practical operation will soon demonstrate the success of the project, or develop its defects.

On April 20 seven trains were put in operation, alternating with the trains drawn by locomotives, but a portion of these had to be withdrawn to remedy some faults developed in their operation. More cars have been prepared for service and now 36 are running regularly. This number will be gradually increased until the 120 cars so equipped will entirely supplant the steam-driven trains.

As will be noted in the views of the interior the finishing touches have yet to be put to the station, but all four of the 1,200-h. p. units are in readiness, together with all the auxiliary apparatus.

The station was planned by Sargent & Lundy, consult-

wide. In the engine room, Fig. 2, there are four cross compound, condensing Allis-Corliss engines with cylinders 26 and 54x48 in.; speed 80 r. p. m. Each engine will develop normally 1,200 h. p., but will carry a 66 per cent overload. The direct connected Westinghouse generators are of 800-k. w. capacity, giving 1,280 amperes at 625 volts, although the generators are capable of running under temporary overloads of 100 per cent. A Reynolds condenser receives the exhaust steam from each engine. They take water from a tank under the cooling tower outside the station and discharge the water into the top of the tower through a 20-in. pipe. In Fig. 3 are seen four of the five motors which drive the 10 fans of the cooling tower, and the switchboard for these motors. These motors are 6-pole, 600-volt and run at 150 r. p. m. A 30-ton electric crane spans the engine room and is equipped with General Electric motors. Pip-



ing from the compressed air system extends to each generator for cleaning the armatures, etc., the air being furnished from a Westinghouse air pump. Oil is supplied by a gravity system, pipes running to all the bearings from a tank placed near the roof of the station. After being used the oil is filtered and two pumps return it to the tank.

The white marble switchboard is shown in Fig. 4 and is unusually compact for so large a station. The four panels to the left in the picture are each for a generator. Each panel has a General Electric circuit breaker and switches, a 2,500-ampere Weston ammeter and field rheostat controller, the resistance of which is under the floor. The next panel to the right receives the entire current of the station and is designed to carry 8,000 amperes. It has a 750-volt voltmeter and an 8,000-ampere ammeter, a General Electric wattmeter, and a Bristol recording voltmeter. The next panel supplies current to the station. This goes to the five

There are eight water tube boilers tested for a pressure of 300 lbs., the pressure of the station being only 160 lbs. All the high pressure steam valves were furnished by the Crane Company. Two vertical oscillating engines drive the chain grates, the exposed furnace surface of each being 7 ft. 6 in. by 8 ft. 6 in.

The boiler feed water is pumped by three Blake compound feed pumps, 10 and 7x12 in., from either the city mains or the condenser discharge. Each boiler has a hot water meter attached and two meters register the water which is supplied to the station from the city water mains. The steel plate stack is 200 ft. high and 13 ft. 8 in. internal diameter at the top. The plates are ½-in. at the bottom and ¼-in. at the top, with a fire brick lining from 9 in. to 4½ in. built up in the interior. There are two flues extending from the boilers to the stack, one containing two Green fuel economizers, the hot gases being drawn into this one from a

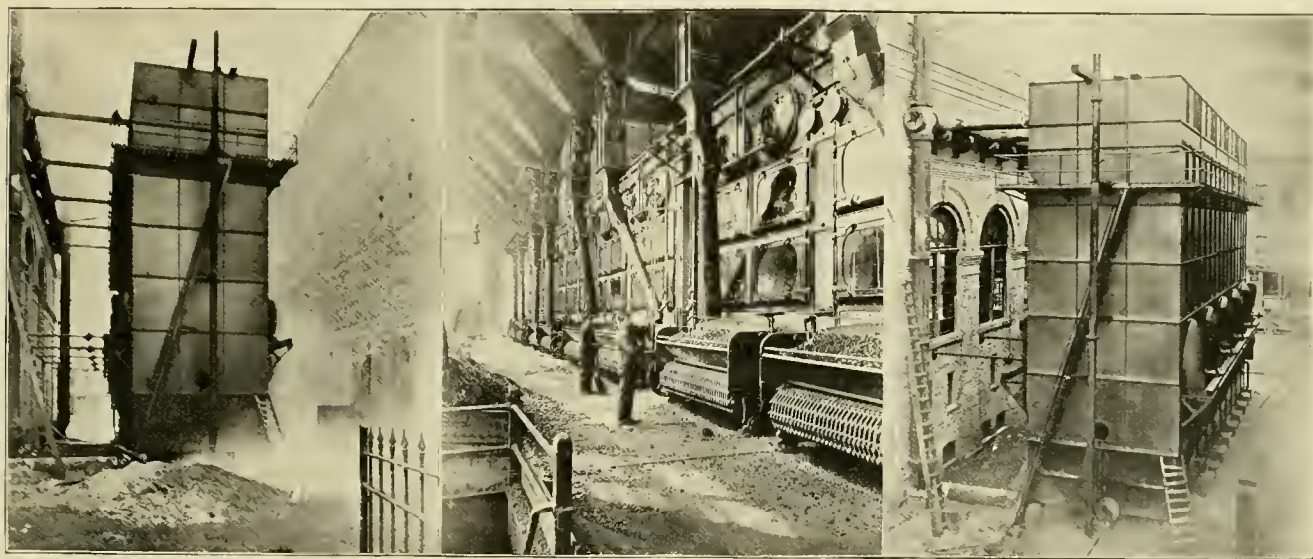


FIG. 5.—COOLING TOWER.

FIG. 6.—BOILER ROOM.

FIG. 7.—COOLING TOWER.

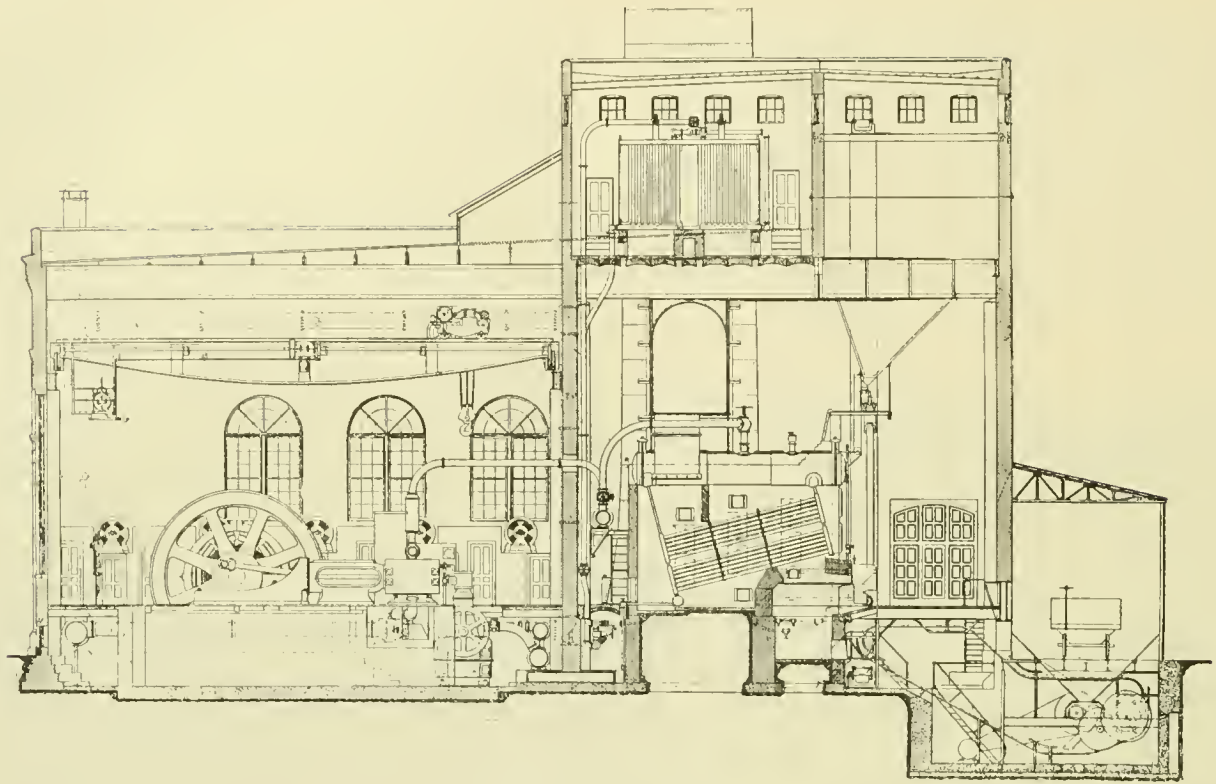
cooling tower motors, the two motors running the coal handling machinery, the crane motors, 200 incandescent lamps and 20 enclosed arc lamps. A recording wattmeter keeps a record of all the energy so used. The four panels to the right are for the eight feeders running out of the station. Each panel has two single pole switches, two circuit breakers with the two ammeters between them.

The five motors mounted in the engine room are connected by shafting to the 10-ft. fans of the Barnard cooling tower, which is notable for its great size. The tower, made by the Wheeler Condenser & Engineering Company, is 64 ft. long, 16½ ft. wide and 34 ft. high, and beneath it is a tank 6 ft. deep. The arrangement of the 20-in. discharge pipe and connections to the tower is plainly shown in Figs. 5 and 7. From each of the five 10-in. branch pipes the hot water is discharged into a header, from which it is sprayed over wire nets which are hung vertically in the tower. The air is drawn in by the 10 large fans and by contact with this air and by evaporation, the water is cooled by the time it reaches the tank in the bottom.

In Fig. 6 may be seen the fronts of the boilers, the mechanical stokers, and the coal tanks in the boiler rooms.

point near the middle of the bank of boilers. This flue is closed when the economizers are not in use.

The station has a complete equipment of coal and ash handling machinery. The coal is delivered from the cars into a hopper and passes through a motor driven crusher. It is delivered by a McCaslin conveyor, made by the John A. Mead Company, New York, to a second conveyor and is carried to the coal bins and tanks above the boiler room. The coal is delivered from the tanks to the mechanical stokers as shown in the interior view of the boiler room. Every pound of coal which passes through the chutes is weighed automatically by a Clark scale. This is the first installation of this apparatus in a street railway power station, but it has been tested in the Edison lighting station in Brooklyn. Every 224 lbs. of coal passing from the hopper into the bucket of the scale act against a weight and lever closing a door to the hopper and the bucket drops down a few inches depositing its contents into the stoker through the chute, at the same time making a record of the load. The bucket is held mechanically until the fireman sees that more coal is needed, and then by means of a rod the catch is tripped and another bucket full deposited. The ashes are collected

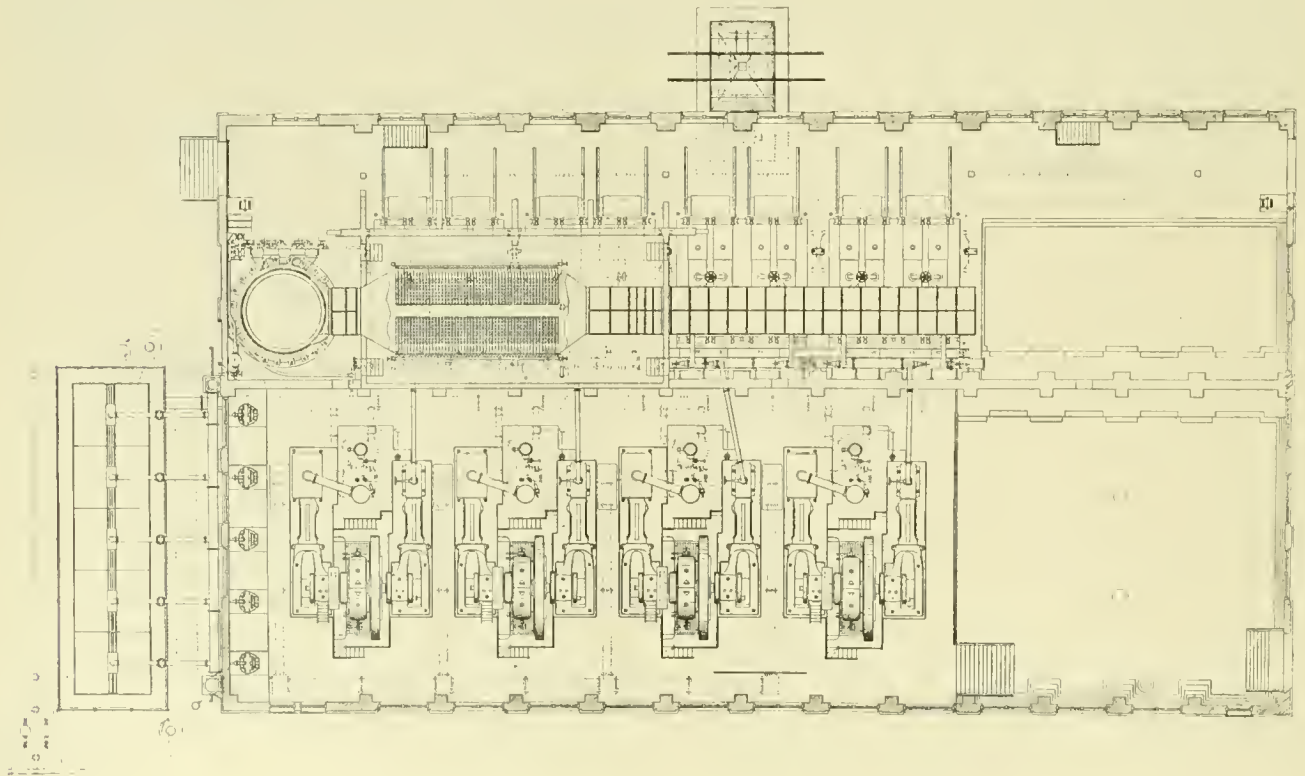


CROSS-SECTION OF STATION.

in the same conveyor which handles the coal. They drop into the ash pit beneath the boiler and are dampened before removing. A hopper running on a rail above the conveyor buckets is rolled to the ash pit door and the door opened. The ashes pass into the buckets to be carried to the ash bin.

There are three feeders extending north of the station, two of 1,000,000 c. m. cross section and one of 500,000 c. m. To the south there are two of 1,500,000 c. m., two of 1,000,000 c. m. and one of 500,000 c. m., cross section

All power station, track and feeder arrangements being practically completed the operation of the full equipment of



PLAN OF POWER STATION, SOUTH SIDE ELEVATED RAILROAD, CHICAGO.



cars is awaited with much interest and anxiety for its success. The trains now in operation run very smoothly, which is a great relief from the jerky movements of the locomotives and the acceleration is much better. However, some alterations have been necessary in the electrical equipment. Among others is a change in the form of the contact box which now resembles in appearance a diminutive controller case and top instead of the cylindrical form described in the REVIEW of December, 1897. Some changes should be made in the throttle board for the current consumption per train in accelerating when the motors are thrown in multiple is excessive and will prove a severe tax on the power station. It was hardly to be expected that there would not be some imperfections in the first installations.

President Carter is rapidly bringing the road out of its financial difficulties and the steadily increasing earnings give promise of it once more becoming a dividend paying property.

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### OBITUARY.

At a recent meeting of the directory of the Columbia Railway Company, of Washington, D. C., a minute concerning the late R. F. Baker was ordered recorded, from which we take the following extract: "Mr. Baker was elected treasurer of the company in July, 1889, and served in that capacity until August, 1893, when he was elected president of the company, and held that office until the day of his lamented death. When he assumed the office of treasurer in 1889, the business of the company was limited, and for several years no dividends had been paid. The success of the company, and its constantly increasing prosperity during all the period of his official connection with it, plainly show the ability with which he directed the policy and plans of the company, and the skill and energy with which he managed its affairs."

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### NEW PUBLICATIONS.

The Electric Storage Battery Company, of Philadelphia, publishes circulars at intervals of about two weeks giving current information in reference to the installation of storage battery plants for lighting and street railway purposes. The pamphlets are fully illustrated from photographs and diagrams.

A hand book entitled "Electricians' Sheet Insulation Manual," has been published by the Mica Insulator Company, of New York and Chicago. The book contains leaves of the insulating cloths and papers made by the company with a description of the properties and purposes of each sample. The M. I. C. compound is described and two testimonials from leading manufacturers of electrical apparatus are given. The book should be of interest to electricians and will be sent upon request.

"Wonderland, '98," is the appropriate title of the annual publication of the passenger department of the Northern Pacific Railroad, devoted to illustrations and descriptions of Nature's freaks and wonders which abound along the entire length of the road. Notwithstanding the beauty and excellence of past years' "Wonderlands," the issue of this year surpasses them all, and constitutes an ornament which in attractiveness and information makes it an addition to any library table. A copy can be secured on inclosing the amount of postage—6 cents—to Chas. S. Fee, G. P. A., St. Paul, Minn.

Laird & Lee, of Chicago, have just issued in their collection of technical reference books, a "Machinists' and Engineers' Pocket Manual," edited by D. B. Dixon, which is a complete as well as compact work. It includes a compilation of rules and solved problems pertaining to steam engines, boilers, pumps, etc., based on plain arithmetic, together with necessary tables, and data of highly practical value. It embraces also a dictionary of terms used

in steam engineering and electricity. This illustrated volume of 371 pages, printed on excellent paper and bound in leather, in pocket form, is sure to meet with wide and immediate recognition. Leather, with rubber band, and pocket; \$1.00.

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### PERSONAL.

C. E. Flynn, manager of the Carbondale (Pa.) lines was in Chicago last week.

John Carson, chief engineer of the Duluth (Minn.) Street Railway, was married to Miss Mary M. Fee on April 20.

H. H. Hilborn has been appointed manager of the Berlin & Waterloo Street Railway Company, of Waterloo, Ontario.

C. S. Bidwell, superintendent of the Trumbull Electric Railroad, Warren, O., has tendered his resignation to take effect June 1.

W. M. Jones, electrician of the Oil City (Pa.) Street Railway Company, was on April 7, married to Miss Ayres, of Jamestown.

Charles H. Stoll, president of the Passenger & Belt Railway Company, Lexington, Ky., has resigned that position and will remove to New York to reside.

C. T. Gage, formerly electrical salesman for the Washburn & Moen Manufacturing Company, in Chicago, has taken charge of the St. Paul office of that company.

Russell Harrison, president of the Terre Haute Electric Railway Company, is to be appointed a major in the engineer corps of the volunteer army.

I. Fuyloka, president of the Tokio Electric Railway Company, and formerly professor of electrical engineering in the Imperial University at Tokio, is making a tour of the United States.

C. P. Coleman, formerly general storekeeper of the Lehigh Valley Railroad Company, has resigned to accept the position of purchasing agent of the Bethlehem Iron Company, South Bethlehem, Pa.

G. H. Chapman, superintendent of the City Railway Company, connecting LaSalle and Peru, Ill., resigned when the receiver took charge, and the latter is conducting the operation as well as the finances of the road.

T. M. Steger has resigned the presidency of the Nashville Street Railway and is succeeded in that office by L. D. Tyson, former vice-president of the company, who for some time past has practically been the president.

G. R. Scrugham, of the Creaghead Engineering Company, was a REVIEW caller when in Chicago, recently. Mr. Scrugham, it will be remembered, was for 17 years with Siemens Bros., of London, who are the largest dealers in electrical appliances in the world.

John M. Anderson, of the well known firm of Albert & J. M. Anderson, Boston, was a Chicago and REVIEW visitor last week. The firm has long enjoyed a large business in the west, and the "war scare" has had no effect whatever, the factories continuing to run at full capacity.

R. E. Sheldon, for some time past the second vice-president of the Columbus Street Railway Company, has been chosen president to succeed Emerson McMillin, who resigned in order to "unload responsibilities of corporations." Mr. McMillin retains his interest in the company.

John McFayden, general manager of the Chester (Pa.) Traction Company, was recently given a complimentary banquet by a number of his Masonic friends in Media and vicinity, in appreciation of the many courtesies extended by him since assuming the management of the road.

## ELECTRIC POWER COMPANIES AND THEIR RELATION TO MUNICIPALITIES.

Abstract of an address by Albion E. Lang, President of the American Street Railway Association, delivered at Purdue University.

Consideration of the relation on the part of an electric power company to the station producing the current, on the one hand, and to the community consuming it on the other, opens a field of thought and discussion quite beyond the possible limits of a single paper, and I must, therefore, touch but briefly the outlines of this field, with the hope of thereby suggesting questions that will bring out an interchange of view along practical lines.

There is a two-fold object which must be accomplished; first, that investment of capital must be made profitable to the investors, and, second, the community must be served in the best possible manner at a minimum cost.

No new or improved electrical equipment of either street railway or light company makes its appearance, that the community does not demand, and the enterprising manager desires to supply. If the company does not respond, the community then demands that it give way to some other company which will do so. Failing in this the cry goes up for municipal ownership. The community gives little thought to the financial condition of electric or even other quasi public corporations, but is ever demanding more—more. This is American, but we are put on our mettle to meet these conditions. How shall they be met?

It was only about 10 years ago that electricity was found to be a practical means of propelling street cars, and it has developed so rapidly in this line, that it has been quite difficult to secure men familiar with the work. Indeed the demand at one time was so great that men were hurried through the shops of the electrical works having acquired but a little practical knowledge, soon to blossom out full-fledged electricians—but in name only. As a result of this hasty and insufficient preparation, these so-called electricians in many instances made mistakes, which were costly indeed, but, nothing daunted, they forged ahead, and succeeded in constructing and equipping many miles of electrical railway all over the country. The insufficient knowledge of electricians was not only evident in the construction and equipment of the railways, but also at the power stations, and at the factories where the apparatus was manufactured. But notwithstanding the crudity of many things in the electrical line and the lack of knowledge in relation thereto, the public was bound to have it, and so property was purchased at enormous prices, a so-called electrical engineer was placed in charge, and the work carried on regardless of expense, and I was about to say—of consequence.

I venture the statement, however, that could some of the owners of street railways using horse power, or some of the capitalists who ventured investment in the earlier electric light plants, have foreseen the almost fabulous sums of money required to convert or construct the same, and the long time they would have to wait—and may still wait, for profits—there would have been much more caution, and much less progress. Once entered upon, there was no convenient stopping place, and in many and many an instance none has yet appeared. But we may say this is American—truly American.

What has been said applying specifically to the street rail-

way plant, is equally applicable to electric lighting plants, so far as the power house, repair shop, and overhead lines are concerned. Each furnishes power useful to the citizen, and each should be made profitable to its owners. As before stated, they are each closely related to the municipality, and the community expects and demands the best possible service at the minimum cost.

How can this be accomplished? It must be borne in mind that many existing power companies, meaning of course street railway and electric lighting companies, have passed through very costly experiments growing out of crude machinery and apparatus they were forced to buy, and inexperienced and incompetent persons employed to install and put the same into operation. Finding that expenses were exceeding revenues, and grasping at every promising improvement offering greater economy, change after change has been made, and is still making, to reach better results, all of which has required increasing capital stock, and the issuing of bonds. There was no other way to avert failure, and avoid the sheriff, and thus many companies have gone forward, piling up debt upon which interest must be paid, and still the end is not yet. Every new plant installed possesses some new features that offer better service, with greater economy, and this forces existing plants to again remodel and change, and create more debt, and consequent increased interest charges.

It is thus plain to be seen, that the cost to the consumer must remain largely unchanged, except in the few communities where the above mentioned conditions have not so largely prevailed. A condition such as this is, of course, unfortunate, both for the community and for the company, and no doubt leads to much discussion of the question of municipal ownership of these properties. Vainly believing that the cost of such service can be materially reduced, and profits proportionately increased, municipalities desire to reap supposed harvest. This I believe to be erroneous under present forms of society and government. I do not believe that municipal ownership of such properties is wise in any sense nor that much will be done in this direction, especially not if private corporations keep pace with the best methods of service and offer reasonable rates. I am one who believes that the community will deal with these corporations fairly, if the corporation will be equally fair with the community. Some corporations are too exacting—too much inclined to reap a harvest of quick return by way of dividends, and provide a rapidly accumulating sinking fund to wipe out original investment.

This method though Yankee-like, and generally called business-like, is not the prudent or wise way of handling corporations, depending on the public for their existence. A better way, it seems to me, is to take the public into your confidence, deal fairly and even generously with it, give the best possible service at the smallest profit consistent with a fair return, on the investment, and reasonable provision for meeting outstanding obligations and future depreciation, in which event the community will deal fairly with you. Citizens should be made acquainted with all the conditions governing properties of this kind, should be informed of the reason for incurring the debts which generally exist, and of the annual and contingent burdens we assume. Fulfilling these conditions fair prices will usually be allowed for transporting passengers upon our railways, and power and light supplied. Where the company is left free to fix its own



prices, no advantage should be taken, but a reasonable and just charge should be made as above indicated. The tendency of the present age is toward lower prices for labor, as well as for the product of farm and factory, and lower interest on money; and electric power companies must meet it.

To do this, no better method can be found than by consolidating under one roof all electric power companies where conditions are favorable. Re-equip with the latest and best types of machinery for generating current, re-arrange circuits for better power distribution, introduce better lamps, repair and keep in good order all the apparatus appertaining to the street railway and light plant. Give the best of service.

There is frequently no other way this can be done but through consolidation, and this can be accomplished without criticism or objection on the part of the community, if followed by reduced cost to the consumer, with first-class service rendered. Corporations, like individuals, sometimes make mistakes, and through miscalculations the expense of construction and operation, or in the eagerness to secure grants, or for various other reasons, they assume these contracts, upon terms, and at rates and prices too cheap to permit giving the best of service, with the result that great dissatisfaction is expressed by patrons and citizens generally, and the warfare between the city and company begins. Furthermore, when such corporations have reasonably profitable contracts, they are sometimes mismanaged by their avaricious owners, scanty service is rendered their patrons, and the result is the same. Again, municipalities, in some instances, through the prejudice or political aspiration of their governing boards, seeking advantage by every method known to their officials, harass corporations, and thus force them to retaliate by giving poor service.

Now, gentlemen, do you perceive the call for your labor and efforts? It is here where your skill is in demand, here where it is your power to work out the problems which will aid in putting this class of property into more profitable operation, satisfactory to owners and the community. The power house, repair shop, cars, track, and lines are the dividend producers, when skillfully and intelligently constructed and operated, and you are needed to carry on this work, needed now—perhaps more than ever before, to pilot safely to a dividend basis, plants of companies already existing. Needed also to wisely inaugurate other enterprises of a similar nature, and thus extend still further the uses and advantages of this wonderful power.

The first consideration of every person as he enters the market to sell his labor, or to invest his money in commercial pursuits, is, how large a return can I obtain, either from labor alone or from labor combined with the investment of capital? Either field is legitimate and proper, but by far the wider is that opened for the sale of labor; and its reward (if the labor be of a higher order), is abundant and certain. Investment of capital with hope of great returns, is speculative and uncertain. If returns are steady they are generally moderate. To rise above mediocre in the sale of labor, one must be either a born genius (which most of us are not), or he must have an ardent love for his profession, and be fully equipped for its practice.

I know of no field more promising than the electrical. In it young men of energy, perseverance and devotion can make a good living, and perhaps acquire a competency. I have briefly indicated some of the problems which will con-

front you when you have entered into active service. It is needless to say that you cannot be too well prepared to meet them. Your ability and education, however, are not the only qualifications necessary to possess in order to succeed. Without an honest, and faithful and constant devotion to the interest of your employer, no permanent success will be attained. You are now acquiring scientific, and as far as possible, practical information in electrical engineering. Some of you will be called to manage electrical properties, to finance them, to look after municipal, county, or state legislation. The broader your information concerning the subject—the higher degree of usefulness you will attain. There is to the student every incentive for faithful, industrious work. The possibilities are unlimited and the reward ample.

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### OFF FOR THE WAR.

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On Sunday, May 1, when the 42nd Separate Company, New York National Guard, of Niagara Falls, was ordered to Homestead Plains, L. I., the citizens gave the company a royal send-off. In order that both ends of the city might have opportunity to see the men in line before their departure for the front, Superintendent John C. Brewster offered the service of the Niagara Falls & Suspension Bridge Railway to transport the company and veterans to the north end of the city, where the line was formed. Our illustration



OFF FOR THE WAR.

shows the scene in front of the armory just as the company came out to board the trolley cars. An immense crowd was present, the majority of people in it being hid by the cars. No doubt but there were many similar scenes in New York on May 1, when the troops started for camp, all displaying the patriotism of street railway companies and their efforts to further the cause of the country. One of the notable features of the Niagara parade was the presence in line of two Canadian fire companies headed by the Union Jack and a Canadian band.

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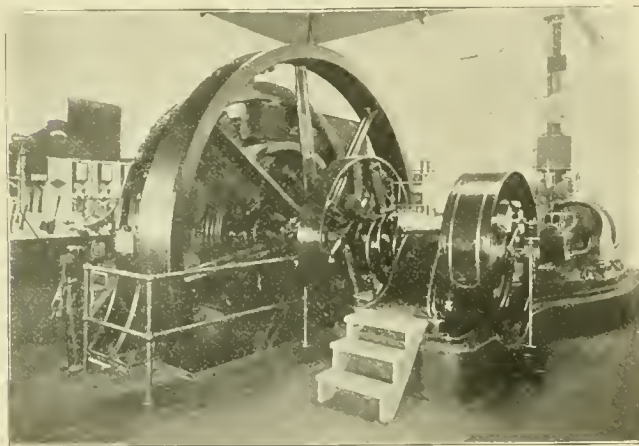
In order to make the Brooklyn bridge self-supporting, a large portion of the revenue having been cut off by reason of the reduced travel on the bridge railroad, an effort is being made to raise the tolls on trolley cars from 5 cents to 10 cents. The 5-cent rate was fixed by the bridge commissioners who now wish to raise it

# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

## Removing a Broken Shaft.

The statement of Lord Chesterfield, "to have a thing well done you must do it yourself," still has its application, sometimes in the street railway business and under circumstances when it might be least expected. That which calls it to mind is the experience of General Manager H. M. Sloan in replacing the 16-in. shaft of a 500-k. w. direct connected unit in the power house of the Calumet Electric Street Railway, it being necessary to take out the original shaft and substitute a larger one. The shaft was broken about the first of the current year, the break occurring in the wheel fit of the governor wheel. Feeling some hesitation in undertaking the work, for which he had not the proper tools, and knowing it would be a difficult matter to handle the shaft, which weighed 14,610 lbs., he thought it would be cheaper to hire a professional, and accordingly let the contract for



500-K. W. UNIT.

the work to a firm which had extensive experience in that line.

In removing the broken shaft, the fly-wheel, which is in two sections, was separated in halves and blocked up; the upper field casting of the generator was also blocked up. It was then attempted to force the shaft out by putting a 300-ton jack between the broken end and the adjacent engine bed, which was held to the armature hub by two long 3-in. bolts; because of improper blocking back of it, the jack was broken.

After waiting several weeks for the jack to be repaired, they made a second attempt and again broke the jack by the pressure applied. Then two 40-ton jacks were placed between the armature and crank disk on the other end of the shaft; this experiment resulted in forcing the disk off and breaking another jack.

At this point Mr. Sloan thought it was time for him to take a hand, as the delay was becoming intolerable, there having been a wait at the start of some weeks for the jacks to be shipped from the east, and then the two delays caused by the breakage. So, after talking the matter over with the chief engineer, D. S. Schrockenstein, they decided to do the work themselves. Within one hour a plan had been laid out and the required material ordered by telephone; this was delivered the following day, and in five hours afterward was put into position. Suitable yokes were put behind the shaft end and the armature, with four bolts, two of 3 in. diameter and two of 3¼ in. diameter, 20 ft. long and threaded with 5 V-threads to the inch connecting them and the nuts tightened up.

For tightening up the nuts a heavy wrench, on the shank of which a piece of pipe 14 ft. long was slipped, was used. To the other end of the pipe blocks and tackle were attached to the floor for pulling down, and blocks and tackle to the roof truss for lifting, and the nuts set up as tight as possible. While the stress was thus on, an iron battering-ram, weighing 1,000 lbs., was swung from the roof truss, and, guided by ropes, tied to either side, was drawn back and swung against a car axle laid along the shaft with its end bearing against the armature hub.

At the first blow there was a crack like that of a pistol and the shaft moved 1-32 in. The time consumed in putting the material into position and getting the shaft started was six hours and a half.

After the first blow it was found that the nuts were stripped and a halt was called until new ones could be made. This being Saturday, to have ordered new forged nuts from the city would have caused another long delay, so Master Mechanic W. A. Harding immediately made a pattern and cast new brass nuts, which weighed 80 lbs. each, the same day, in the company's foundry. Monday morning they started to work again, following up the same process of tightening nuts and using the ram until, at the end of three days, it was out.

On examining the bolts to see if they were suitable for putting the new shaft in, it was found that they were stretched a full thread to the inch, necessitating cutting them off and turning new threads. In threading the bolts, Mr. Harding conceived a plan which facilitated the gaging of the threads and also made it much easier to handle the nuts when the bolts were in use. The bolts being too long to be held between the centers of any lathe at hand, the tail-stock was removed and the shaft supported in a bearing on the bed. When first made, the machinist had tapped a hole in the end and inserted a set screw, which was grasped by the lathe chuck when cutting the thread, thus making it necessary to take it out of the chuck and swing it back in order to try the nut. Mr. Harding first turned down the end of the shaft below the root of the thread for a distance greater



than the length of the nut, and thus provided a resting place for the nut, always in position to be tried, and permitted the chuck to grasp the bolt end. The convenience of this arrangement for an 80-lb. nut is easily appreciated.

Then the bolts and yokes were again put in place over the new shaft end and armature and the nuts set up. In putting in this new shaft a battering-ram of timber, 12 in. x 12 in. x 18 ft., was used against the end, which was put in place in one day and a half, and five hours for getting the material into place, making the time spent on the two shafts 6 days, the delay 2 days, or a total of 8 days. When against this is placed the time spent by the firm having the contract at first, which, including delays, was 3 months, without accomplishing anything, the story is told.

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#### Cost of Niagara Power in Buffalo.

The Cataract Power & Conduit Company, of Buffalo, has determined upon a schedule of charges for the power transmitted to that city from Niagara Falls after a thorough investigation by competent engineers as to the cost of power under varying conditions. It was thought unfair to charge strictly by meter or at a lump sum of so much per year, as some power users would take the amount contracted for during the entire day and others would use it intermittently. It was decided that the assessment should be in two items, viz., a charge for service and a charge for power. The charge for service is at the rate of \$1 per kilowatt per month, this charge depending directly upon the amount of power that the company is required to keep available for the lessee. The monthly charge for power will be in proportion to the actual amount used, as determined by the standard meters installed on the premises of the consumer.

The unit of power is the kilowatt-hour and the charge for power will be determined by the record of the meter and by calculation from the following schedule:

For use not exceeding 1,000 units, the rate shall be 2 cents per unit.

For use exceeding 1,000 units, but not exceeding 2,000 units, the rate shall be: For 1,000 units 2 cents per unit, and for the excess 1.5 cents per unit.

For use exceeding 2,000 units, but not exceeding 3,000 units, the rate shall be: For 2,000 units 1.5 cents per unit, and for the excess 1.2 cents per unit.

For use exceeding 3,000 units, but not exceeding 5,000 units, the rate shall be: For 3,000 units 1.2 cents per unit, and for the excess 1 cent per unit.

For use exceeding 5,000 units, but not exceeding 10,000 units, the rate shall be: For 5,000 units 1 cent per unit, and for the excess .8 cent per unit.

For use exceeding 10,000 units, but not exceeding 20,000 units, the rate shall be: For 10,000 units .8 cent per unit, and for the excess .75 cent per unit.

For use exceeding 20,000 units, but not exceeding 40,000 units, the rate shall be: For 20,000 units .75 cent per unit, and for the excess .70 cent per unit.

For use exceeding 40,000 units, but not exceeding 80,000 units, the rate shall be: For 40,000 units .70 cent per unit, and for the excess .66 cent per unit.

For use exceeding 80,000 units, the rate shall be: For 80,000 units .66 cent per unit, and for the excess .64 cent per unit.

These rates are for a three phase alternating current as delivered from the three substations. A few calculations will perhaps put these rates in shape for comparison. If a small consumer used power continuously for 10 hours a day and on an average of 25 days in the month, it will be necessary to

reserve at least 4 k. w., or to allow a margin of 20 per cent, 5 k. w. For these 1,000 units he pays \$20 per month and \$5 for charges for service. The cost will be \$300 per year or \$75 per k. w. used or about \$56 per h. p. per year. This does not seem to be especially low but as the electric motor dispenses with the dirt, help and floor space otherwise occupied, the electric power is preferable.

A comparison of these rates with the cost of power to some of the street railway companies will show whether the rates are entirely fair to the large consumers. Referring to the table on the cost of power on another page, we may take as an example station No. 3. The output of 275,380 k. w. h. would cost at the lowest figure given in the rate sheet, .64 cent per unit, \$1,762. At the very least it would be necessary to reserve 1,000 k. w. for the service. It will be readily seen that the reserve would not necessarily be as great as the present capacity of the station which makes allowances for sudden overloads, repairs, etc. The charge for service would be \$1,000, making a total of \$2,762 as compared with the present expense of \$1,994. If now we assume the efficiency of the rotary converters to be 90 per cent, the cost of the rented power becomes about 1.1 cent per k. w. h. as against .724 per k. w. h. for station No. 3. Whether it would be cheaper to rent power at this rate depends upon the relation the fixed charges bear to the operating expenses; as a rough estimate we should say that the fixed charges would be less than half as much with the rented power. Also there is but little doubt that even a smaller rate would be made to such large consumers.

\* \* \*

#### Brazed Copper Steam Pipes.

A very interesting article on this subject appeared in a recent issue of London "Engineering," in which the use and failures of copper pipes were discussed. In order to avoid expansion joints in pipes connecting engines and boilers they must have curves or bends in them. As copper takes "punishment" easily shorter sections of curved pipe could be used if made of that metal, and the extensive use of copper steam pipes on board ships, where space must always be economized, was a natural result. It is stated that of the failures of copper pipe investigated by the Board of Trade, by far the larger number proved to be due to faulty design, the thickness of the pipe being increased to carry higher pressures, without considering that the pipe was thereby made stiffer and needed, therefore, to be longer. An accident on board the steamship *Prodano* in 1891 developed another cause of failure, deterioration of the brazing. The pipe in question had been inspected when new by Lloyd's and nine months later burst, killing four persons. The Board of Trade found that the brazing was defective at the outset, a conclusion combatted by Lloyd's, and pieces of the broken pipe, samples of incrustation scraped from the inside, samples of oil and of an anti-corrosive fluid used in the boilers, of the brazing solder used, and portions of the main steam pipe of another vessel were submitted to a chemist, Professor Arnold, for examination. An examination of the brazed seams of the *Prodano's* pipe showed a change to have occurred in a large proportion of the solder, large areas showing up as a finely-granulated coppery-looking mass. There was not a sufficient amount of the solder from the *Prodano's* pipe available for a chemical analysis

## COST OF POWER FOR ELECTRIC RAILWAYS. Output Measured by Wattmeter in Each Case.

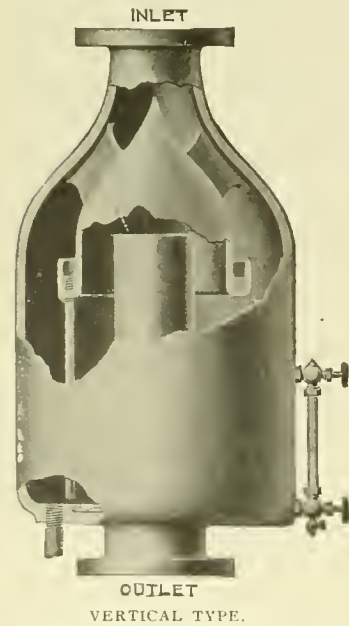
STATION.	MONTH.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.					Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel per k. w. h.	Price of Fuel per Ton of 2,000 Lbs.	Kind of Fuel	
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.							Total.
1.....	Feb.	1,227,716	.313	.173	.029	.033	.035	.583	3.4	.9	10.	2.95	\$2.12	Bituminous.
3.....	"	275,380	.449	.208	.050	.013	.004	.724	4.3	5.8	.....	4.22	2.13	"
4.....	"	348,155	.347	.170	.027	.....	.010	.555	3.27	3.41	.....	3.21	2.16	"
5. Metropolitan Elevated, Chicago.	"	1,809,799	.328	.135	.017	.017	.070	.567	4.7	1.3	5.38	3.55	.....	Slack.
6.....	"	474,850	.781	.252	.088	.....	.088	1.209	.....	.....	.....	2.72	.....	Oil.
8.....	Jan.	966,368	.544	.249	.087	.....	.056	.936	.....	.....	.....	.....	.....	.....
8.....	Feb.	880,000	.545	.247	.069	.....	.020	.881	.....	.....	.....	.....	.....	.....
9.....	Jan.	212,090	.749	.463	.086	.....	.014	1.312	.....	.....	.....	.....	.....	.....
9.....	Feb.	223,844	.500	.373	.081	.....	.026	.980	.....	.....	.....	.....	.....	.....

of it, but the solder from the other pipe was analyzed and found to contain but 18 per cent of zinc, the original proportion of zinc being probably 38 per cent. Its spongy condition was shown by the reduction of its specific gravity from 8.24 to 7.45. It was further found that the zinc remaining was completely oxidized, the oxidization resulting, it is thought, from the fatty acids arising from the decomposition of the lubricating oils used in the high pressure cylinder. The suggestions made to avoid the danger due to deteriorated brazing, are use iron or steel pipes (with expansion joints where cramped for space) or possibly the flexible metallic tubing which is on the market.

\* \* \*

### A New Steam Separator.

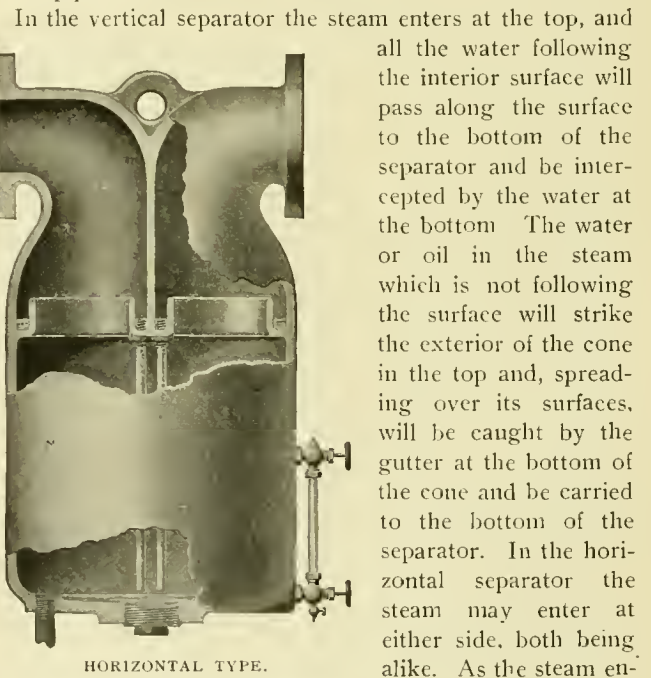
The accompanying illustrations show the steam separators recently placed on the market by the Hoppes Manufacturing Company, of Springfield, O., in which the effort of the designer has been to secure as great efficiency as possible in the separation of the entrained water from the steam with the least possible obstruction to the flow. With this object in view the interior is made as smooth as possible and all sharp corners or depending ledges have been avoided, as these not only add friction, but worst of all the entrainment would be blown from them by the force of the current and sprayed into the steam again.



VERTICAL TYPE.

As will be seen the steam inlet gradually enlarges into a steam chamber of 10 times the area of the pipe and is then gradually reduced to the original area. No baffle plates or other obstructions are employed and the steam is not required to take on any centrifugal, zigzag or other tortuous motions in its passage through the separator. The moisture is intercepted by the troughs or gutters which are partially filled with water; these also effectually intercept oil. The excess of the en-

trainment is carried to the bottom of the separator by the small pipe shown.



HORIZONTAL TYPE.

ters it passes one of the gutters, and as it ascends on the other side it passes the other.

All of the separators for pipes above 8 in. in diameter are made of flange steel, as are also the combined separators and receivers made by this company on the same plan.

\* \* \*

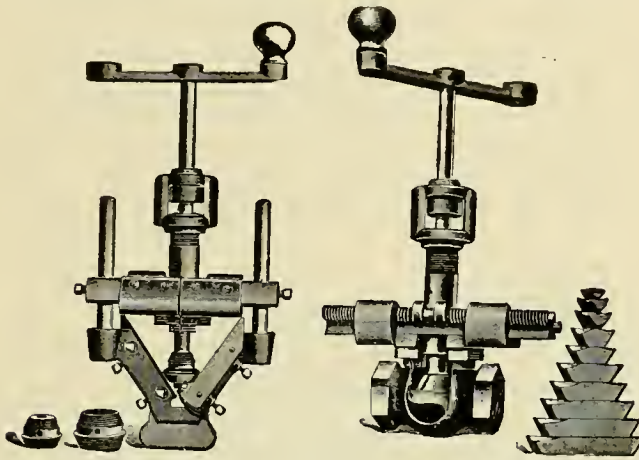
### Valve Reseating Machine.

The value of a practicable and reliable valve reseating machine is now well-recognized, the saving effected by its use greatly exceeding, in a short time, the cost of the device. Taking the weight of steam discharged per second as the product of the area of the orifice by the absolute pressure divided by 70, the weight per hour with steam at 125 lbs. per gage would be 7,200 lbs. for an orifice 1 sq. in. in area. The cost of evaporating 1,000 lbs. of water into steam at 125 lbs. is probably not less than 12 cents, and may be much more, and hence in one hour an opening of 1 sq. in. would discharge at least \$.86 worth of steam. Of course valves do not have leaks aggregating 1 sq. in. in area, but the calculation shows how a few small leaks may easily waste considerable money.



The Benton valve reseating machine here illustrated, is handled by Wendell & MacDuffie, of New York and Boston, and can be attached to all valves regardless of the size of the thread or of the opening in the valve hood. The valve seat is cut with reversible self-cleaning tools, which may be ground when dull.

The attaching device consists of a block-chuck with gibs placed between the two blocks and the bar to take up the slack. Upon the under side of the blocks is a series of parallel segment-shaped steps, the curved face of each step being threaded to correspond with the threads of valve casings



BENTON VALVE RESEATING MACHINES.

with which the steps are designed to engage. The screw rod opens or closes the chuck jaws.

The outfit also comprises a disc dressing device, the cutters for which are on the inner opposite edges of a V-shaped bar. These cutters or blades are attached to this bar by means of screws that pass through slots in the bar, and thus permit of a rigid angular adjustment of the cutters. It is to be noted that the cutters or blades, by being located on the sides of said bar, have their cutting edges presented on lines tangential and not radial to the valve being ground; hence they do not unduly bite into the valve, and objectionable chattering is avoided.

### BUFFALO & LOCKPORT INTERURBAN.

One of the largest recent railroad deals has just been perfected in New York, where the Buffalo & Lockport Railway Company has been incorporated to operate a street surface railroad between Buffalo, in Erie county, and Lockport, in Niagara county, by way of the Tonawandas. The capital stock of the new company is \$1,000,000 in 10,000 shares of \$100 each. The men named as directors for the first year are as follows: W. Caryl Ely, Frank A. Dudley, of Niagara Falls; John A. Merritt, Frank M. Ashley and S. Curt Lewis, of Lockport; H. J. Pierce, Robert L. Fryer, G. H. Dunbar, Burt Van Horn, of Buffalo. Mr. Ely is president of the new company, Henry J. Pierce, of Buffalo, is vice-president, and Burt Van Horn is to be secretary, treasurer and general manager. Mr. Ely is president of the Buffalo & Niagara Falls Electric Railway Company and is also first vice-president of the American Street Railway Association. Mr. Van Horn is the general manager of the Buffalo & Niagara Falls Electric Railway. One of the very interest-

ing features of the company's plans is that it has secured a lease of the Tonawanda-Lockport branch of the Erie Railroad, and will operate electric cars over it. The company's line commences at the center line of Hertel and Virgil avenues in Buffalo, runs along Hertel avenue to Kenmore avenue, to Delaware street, Tonawanda, to Young street, to Delaware street, crosses the Ellicott creek, Erie canal, Tonawanda creek, to Main street, to Sweeney street, to the Erie Railroad, Lockport branch, thence to the junction of Main and Transit streets, in Lockport, where the line will join the tracks of the Lock City road, which road the Buffalo & Lockport Company will operate, it is understood. The company may also build from the junction of the Erie tracks and Sweeney street in North Tonawanda to the Elmwood avenue and Tonawanda Electric Company, better known as the Kenmore line. Mention is made of extending the present line in Lockport along Hawley street to Glenwood avenue.

The total length of the line is given in the papers of incorporation as 29½ miles. The length of the Erie branch of which the company has secured control, is 13 miles. It runs through Martinsville, Hoffman, Pendleton Center, Hodgeville. Pendleton Center is named as the location of the principal offices of the company. The company expects to get the line in operation during the summer, possibly by July 1.

The Tonawanda-Lockport branch of the Erie has always had a pretty fair patronage, and it is expected that the new road will enjoy a heavy travel. From the composition of the new company it is fair to suppose that connection will be made at North Tonawanda with the tracks of the Buffalo & Niagara Falls road, so that cars may be run from Niagara Falls to Lockport, or from Lockport to the Falls. It is also intimated that the new company will build a line from Lockport to Olcott on Lake Ontario, something Lockport people have wished for many years, as Olcott is their popular short vacation point.

Hon. W. Caryl Ely, who was the chief promoter of the line, in company with Hon. Frank A. Dudley and Burt Van Horn, is recognized as one of the very brightest street railway men in the country. He is admired for the manner in which he maps out his line of action, and the successful way in which he puts through his projects.

The certificate of extension placed on file in the office of the secretary of state states that the extension to Olcott is to commence at Market street, corner of Mill and Exchange streets in Lockport, and run east along Market street to Lake avenue, north to the northerly limits of the city, along the lake road to a point of intersection with the boundary line between towns of Lockport and Newfane, thence northerly to the village of Olcott and within the village of Olcott in an easterly and westerly direction, along the highway, running parallel with the south shore of Lake Ontario, a distance of one-half mile in each direction.

Work on the Detroit, Lake Shore & Mt. Clemens road, which is to connect with the Citizens' at Jefferson avenue, Detroit, and run to McSweeney's club house, a distance of 15 miles along the shore of Lake St. Clair, was begun on April 28. President M. B. Mills drove the first spike at the northern terminus, and the party invited to witness the ceremony then adjourned to a dinner at the club house.

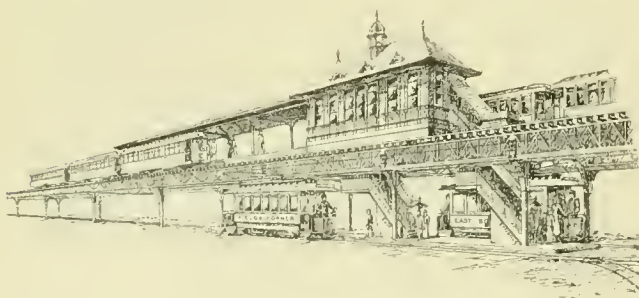
## STATIONS FOR THE BOSTON ELEVATED.

The people of Boston are celebrated far and wide for their culture and even the railway companies cater to their good taste. In order to get designs for elevated stations that would possess architectural symmetry with utility the Boston Elevated Railway Company offered a prize of \$1,000 for the best plans. The engineers of the company, after consultation with J. A. L. Waddell, of Chicago, and other engineers experienced in elevated railway construction, prepared plans for the structure and a typical island station which combined strength, convenience and security and then referred them to 11 prominent firms of architects in Boston.

Each competitor was to offer one design with three drawings showing the side and front elevations and a sheet of details. The cost of construction was not to exceed \$15,000. The company then called in consultation W. E. Baker, general manager of the Metropolitan West Side Elevated Railroad Company, of Chicago, W. T. Goundie, general manager of the King's County Elevated, Theodore Hooper, of New York, and Prof. W. R. Ware, of the architectural department of Columbia College. The drawings were all submitted under designations which did not indicate the designer and the names were in sealed envelopes.

After a careful review of all the points the committee selected the plans of W. A. Longfellow. The stations are to be built in the early French Renaissance style, a side elevation and a perspective being shown in the cuts. In the legislative act the approval of the mayor of Boston was required for all plans showing the form and method of construction and architectural appearance of the elevated stations.

Each station is to be  $12\frac{1}{2} \times 40$  ft. and connecting with a covered platform 160 ft. long. It will be 18 ft. in height from the tracks to the ridgepole and will be reached by a stairway of 38 steps, broken by two landings. The stairway starts from the curbing beside the posts of the structure



BOSTON ELEVATED STATION.

and after rising 10 ft. turns to the right. The passenger enters the station at a lobby, goes past the ticket window and into a waiting room and then to the covered platform to take the train.

The passengers leaving the train on the opposite side of the platform pass directly to a stairway which runs beneath the building. The stairways will obstruct the street as little as possible and yet afford room for the passengers who take the same stairway for either the north or south-bound trains. The plans embody the latest and most approved ideas for



MAP SHOWING BOSTON ELEVATED RAILWAY.

elevated traffic, giving the impression of lightness, symmetry and beauty to the structure.

The location of the 11 stations is shown in the map taken from the "Engineering News." The length of the lines to be built at present time is  $5\frac{3}{4}$  miles and the distances between the stations vary from .2 to 1.08 miles. The dotted portion on the map represents the route of the elevated trains through the subway, two of the subway tracks being reserved exclusively for elevated trains. Between the subway and the elevated structure there will be an incline with a grade of 5 per cent.

At the terminal stations the surface cars will pass up inclines to the level of the elevated trains. These stations will be very spacious, the Roxbury terminal being  $125 \times 700$  ft. The running time between the terminals is to be 22 minutes, with stops of 10 seconds at each station. The cars will be similar to those in Chicago, about 47 ft. long and will weigh 33,000 lbs.

Boston is the only city in the world where both the surface and elevated systems are under the control of the same company. Free transfers are given between the surface and elevated cars so that the elevated lines are designed to carry the express traffic between the center of the city and the outlying districts. The South Boston, East Boston and the Cambridge lines will be constructed at a later date. It will require a year for the construction of the work already planned.

## INCREASED EARNINGS FOR 1898.

In the Review for April, page 220, by a typographical error the earnings of the Schuylkill Valley Traction Company for the first quarter of 1898 were stated to be 12.5 per cent in excess of those for the first quarter of 1897. The actual increase in earnings for the quarter was 15.5 per cent.

The directory of the Albany, Helderburg & Schoharie Electric Railway, which has had an existence on paper for four years, at the last meeting deposed the president, John W. Van Valkenburgh. It is alleged that he unduly delayed the taking of any steps towards building the road.



## A PASSENGER LOCOMOTIVE TRUCK.

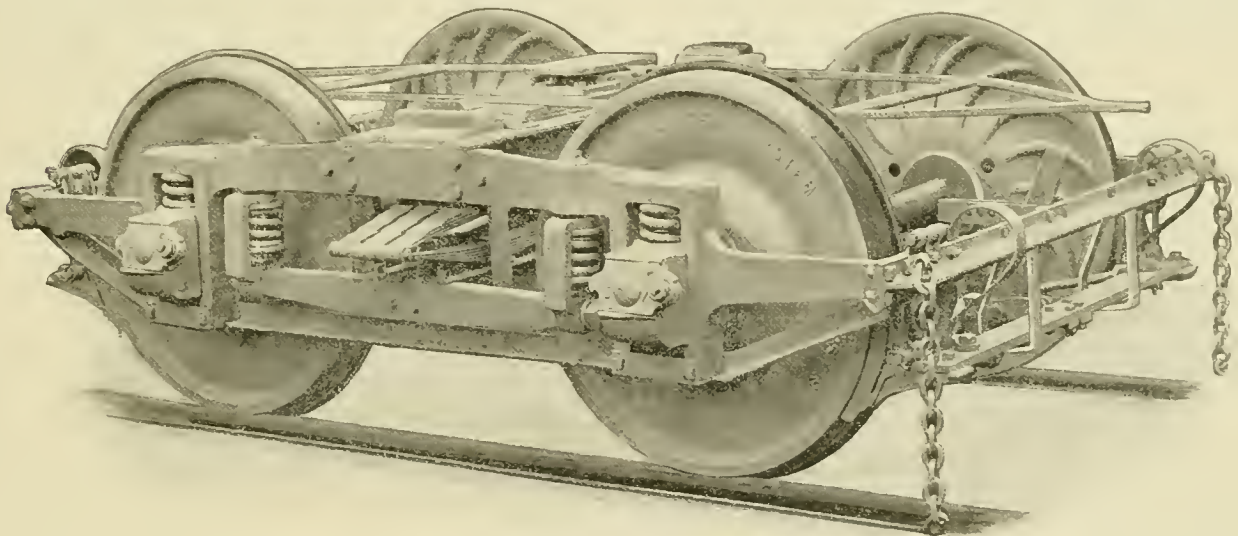
An audacious experiment in electrical railroad work is being tried in France which, in many respects, is more in harmony with American than French engineering. The idea is to construct an electric passenger locomotive which shall not only haul a train but shall carry passengers as well. This idea is not exactly novel to American street railway men, but it is to be carried out upon a scale and in a manner which has never been attempted in this country, an ordinary electric car hauling a trailer is the limit of American work in this line.

The French proposition is to build a moderate sized double truck passenger coach weighing complete 96,000 lbs., and provide it with sufficient motive power to utilize the adhesion obtained by this weight. This locomotive is to haul the train and carry passengers. The line is some 200 miles in length and express speed is to be maintained.

The car body for this machine was built in France and

To meet the requirements of the locomotive alone the trucks are built in the most substantial manner. The side frames which also form the jaws for the journal boxes are massive forgings nearly as large as the bars of a locomotive frame. They are deeper but not as thick. The end pieces of the frame are T-irons carried by palms worked upon the side pieces. The seats in these palms are finished and the holes are reamed for taper bolts. Locomotive practice is followed in constructing these trucks and wherever bolts are used they are made taper and the holes are reamed. The swing bolster is held between a pair of angle iron transoms which are bolted to the side frames of the truck. The ends of the angle are cut out and bent so as to form brackets for the purpose. The wheels are of unusual size, being 45 in. in diameter. They are of cast iron and are mounted upon very large axles. These are 7 ft. 6 in. long, and 5 in. in diameter at the wheel fit.

The journals are  $4\frac{1}{4}$  by 8 in. Each truck is furnished with a pair of 150-h. p. motors thus giving the car 600 h. p. The trucks weigh 11,080 lbs. each, the motors 10,000 lbs. per



BRILL LOCOMOTIVE TRUCK.

only a few details are at hand in regard to it. The floor frame is of channel bars. It is 36 ft. 9 in. long and 6 ft. 9 in. wide. The channels are apparently about 10 in. deep. There are six crossings spaced so that the outer ones are 5 ft. 10 in. from the end of the car. No details whatever are given in regard to the body which is carried by a pair of the J. G. Brill Company's No. 27 ("perfect") trucks of the type especially designed to meet the requirements of steam passenger cars. These trucks are quite as great a departure from the common order as the scheme for the car itself. One of them is shown in the illustration.

Under the conditions here presented, these trucks have two very distinct functions. The first is that of the locomotive carrying the propelling machinery, keeping it in alignment and transmitting its pull to cars, etc. The trucks must perform all the essential work of a locomotive engine. Their second function is that of a railway carriage. The car and the machinery must be carried without shocks or disturbance, curves must be passed smoothly and without danger and the load must not exert a destructive action upon the roadbed.

pair and the car body 24,000 lbs., bringing the weight without passengers up to a little more than 66,000 pounds. Lead or iron ballast will be used to get the required load of 96,000 pounds.

So far as the constructive features are concerned, locomotive practice has been followed because it is the best for the purpose. Strength to carry the load, stiffness to resist strains, and weight to secure adhesion, have been provided. In the ordinary electric locomotive, these requirements met, builders appear satisfied and give no consideration to other matters of equal importance. An entirely new departure has been made in the locomotive truck for the French car. Ease of riding was considered of the utmost importance and it was determined to make it ride as smoothly as a carriage should, while at the same time it possessed all the necessary features of strength, stiffness and durability.

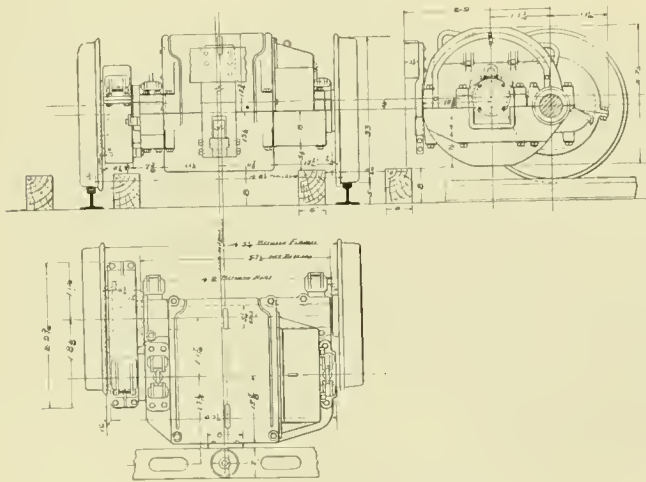
In these trucks there are springs over the journal boxes, and the heavy equalizers are carried on links in which are springs of the same capacity as those over the boxes. The equalizing bar is a part of the swing motion and is firmly attached at its center to the spring plank. On the spring

plank are two sets of triple elliptics; quadruple springs would have been preferable but in this case the contract limited the wheel base to 6 ft. and there was only room for triple springs. The spring links carrying the equalizer are hung to the wheel piece a short distance from the centers of the journal boxes; at the lower end is a spring seat and at the upper end the post has a square head under which a hemisphere is finished which, with a cup in the solid frame, forms a ball and socket joint.

The boxes are M. C. B. standard. The brake rigging is nearly the same as that used on heavy steam car trucks; it should be noted, however, that the double brake rod is a feature introduced for clearing the motors which come up very high; this double rod is of pipe and quite light.

### MOTORS FOR THE BROOKLYN ELEVATED.

The Walker Company, of Cleveland, O., has a contract to deliver 50 80-h. p. motors for elevated cars to the Brooklyn Elevated Railroad Company before June 1. Further deliveries will be made sufficient to equip 75 motor cars. On



WALKER 80-H. P. MOTOR FOR BROOKLYN ELEVATED.

account of the fluctuating traffic in the morning and evening on the Brooklyn lines the company has decided to use the Sprague "multiple unit" system and the Walker 20 L motor.

This type of motor has been designed and tested by Prof. S. H. Short, vice-president and engineer of the Walker Company. They were subjected to the severest tests in service on the Lake Street Elevated Railroad in Chicago, and the Brooklyn motors will embody all the advanced ideas gained by those experiments. The cars equipped with two of these motors will have a scheduled speed of 16 miles an hour, including stops.

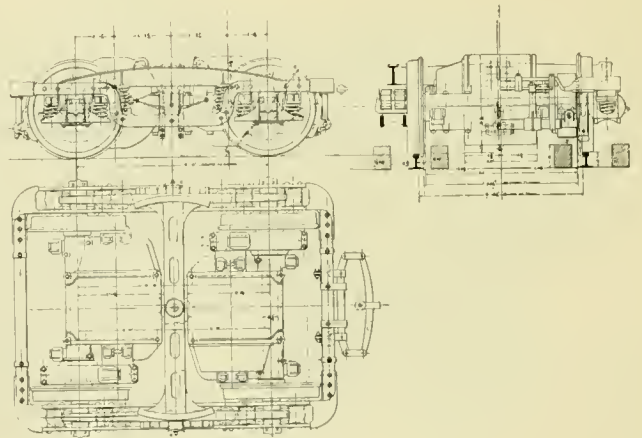
In appearance and in design the motors resemble generators. The magnet frame is circular, with the four laminated steel pole pieces and pole shoes bolted on the interior. The bearings are all of hard bronze, 10 in. long and 4 in. in diameter. The oil boxes on each side or end of the shaft are filled with oil and contain waste which oils and wipes the bearings, using the same oil over and over again. The oil is absolutely restrained from spilling or dripping and from getting into the interior of the motor.

There is no wire about this motor and all the insulation is mica and asbestos. All the windings on the fields and armature are of bar copper and the armature is built up like

that of a generator, with the windings in deep slots. In every detail it is built to withstand the heavy strains which come upon it in elevated railway service. The motors are mounted on McGuire trucks and the manner of suspension may be noted from the cut.

### OTTUMWA ROAD SOLD.

The Ottumwa (Ia.) Electric Railway was sold April 28 by order of the United States court for \$190,000, and passes into the hands of the Ottumwa bondholders. The plant cost about \$400,000, and by this action the stockholders lose every dollar of their investment. In addition to operating the street railway, this company has heretofore done all of the municipal, commercial and residence electric lighting business in Ottumwa, but we learn it is soon to have a competitor in the light and power business. This part of the business of the old company, it is understood, has been profitable, but their equipment is far from being up-to-date and cannot be operated as economically as that of the newer types. The new company, to be known as the Consumers'



Electric Light & Power Company, expects to put in a complete modern plant, materially reduce the rates to the public generally, besides making special concessions to its stockholders. They also expect to compete for the street lighting business when the present contract with the city expires in about 18 months.

We understand that one of the largest electric companies in the country is interested in the new project and that it also has other strong financial backing, but as the name indicates, it is to be composed largely of consumers of electric light and power. Many of the largest consumers have already subscribed for stock, and we learn that some 300 shares of stock (\$100 each) have already been subscribed. Up to this time the work has been carried on quietly, but it is the intention to push it vigorously in the near future.

A resolution has been introduced in the Buffalo council looking to the adoption of an ordinance providing for 3-cent fares for workmen between the hours of 5 and 8, both morning and evening. If the council has not power to compel this reduction, a campaign will be conducted in the next legislature to secure a special law authorizing it.



## BARNEY &amp; SMITH ELECTRIC MOTOR TRUCKS.

The accompanying illustrations show the Barney & Smith Company's standard electric motor trucks. Fig. 1 is the Class G, which is the standard for single truck city cars. The truck is designed especially for simplicity, strength and durability. The truck frame is entirely of wrought steel, the side frames being composed of two plates of steel securely bolted together with distance castings between the malleable iron pedestal castings which bolt to

plates. This half-elliptic spring is provided on the inside end with a hook bolt which passes down through the truck corner plate with a nut on the under side, by means of which the ends of the car body can be adjusted to a level position should the body from any cause become lower at one end than the other, and by means of this same spring the rocking and pitching to which most cars are addicted are entirely overcome.

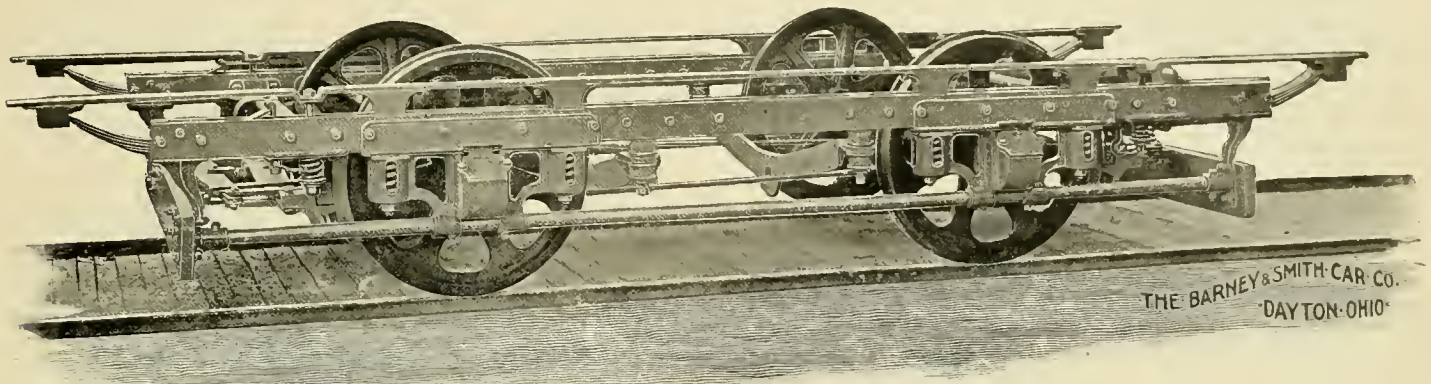


FIG. 1.—CLASS G MOTOR TRUCK.

these side frames at, or over the journal boxes, the pedestal castings being free to move on the journal box by the action of the spring. A half-elliptic spring rests on the top of each journal box. In each end of this half-elliptic spring is a slot through which passes a bolt with a "T" head, which bolt passes through the coil pedestal springs to the underside of the spring seat in the pedestal casting; on the lower end of these bolts are the nuts for adjustment.

On the top of the coil pedestal springs rest the spring castings which are fastened to the body spring plate, and upon which the car body rests. The car body is also supported at the end of the truck by a half-elliptic spring, which has its bearing at the extreme end of the truck side frame, on a casting which is securely fastened to the truck frame

The especial features of this truck are the unusually long side truck frame—the length of the spring base against the car body and the half-elliptic adjusting spring at the end of the truck frame just referred to above. Another feature which will be of interest to the railway manager is the small distance at which the car body is carried from the ground, being enabled with this truck to bring the under side of the car body down to 28 in. from the rail with a 33-in. wheel.

One of the great causes of annoyance in the past has been the inability of truck builders to perfect a brake that would work satisfactorily under all conditions. This object has been attained with the greatest degree of success in this truck; the brake is perfect, the braking power being

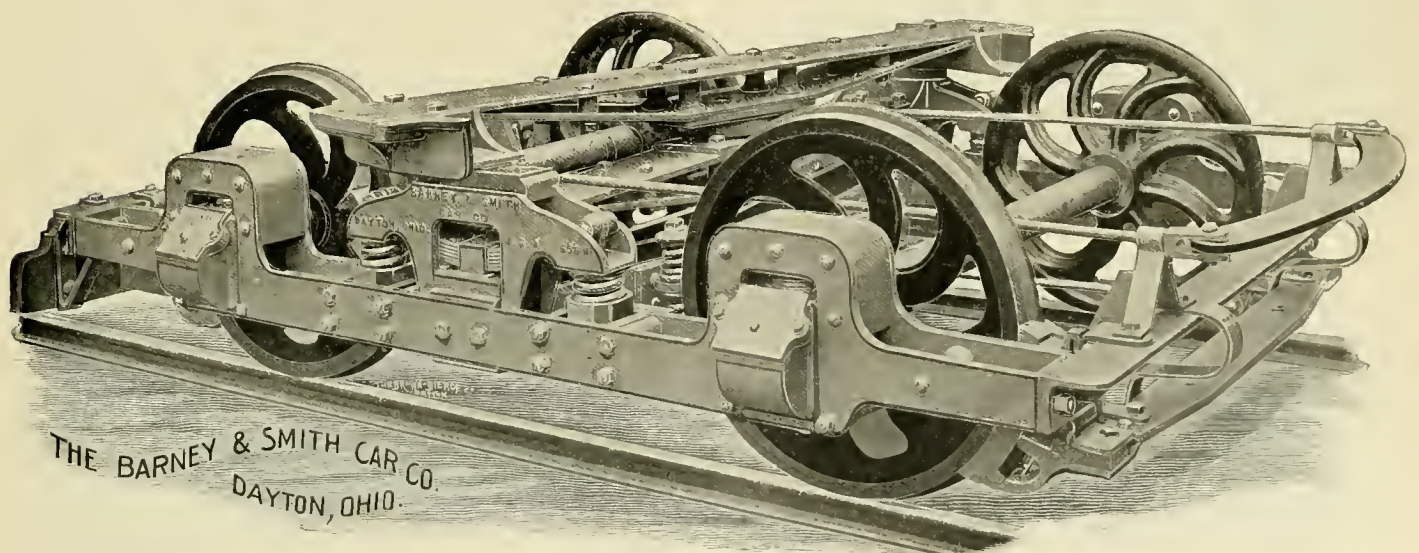


FIG. 2.—CLASS H DOUBLE MOTOR TRUCK.

equally divided on each wheel, and the brake shoes are interchangeable and easily removed.

The ease and simplicity with which the wheels and axles can be removed is a point not to be overlooked. To accomplish this, it is necessary only to remove the lug at the bottom of the pedestal jaw beneath the oil box, the removal of the wheel and axle being accomplished without disturbing any of the springs in the truck. The truck is compactly built and has very few parts to get out of repair and consequently is maintained at a minimum cost for repairs.

Fig. 2 is the standard Class H pivotal truck, designed especially for suburban and city service where double truck cars are used. The idea in the design of this truck is the height. It is so constructed that the car body is carried very low, and avoids the great height from the rail to the car body, which is made necessary by many of the pivotal trucks in use.

The side plates of the frame are made of one solid piece of soft steel without welds of any kind, and the two plates on each side frame are securely bolted together with distance castings between; over each journal box and between the side plates of the frame is a coil spring so arranged as to carry the weight of the truck frame. On each side of the side frame at the center are the side bearings, which are securely fastened to the ends of the truck transom, which is made of 8-in. wrought iron, and to which are fastened the center plates. The weight of the truck transom and side bearings upon which rests the body bolster of the car is carried by an arrangement of springs, as is clearly shown in the illustration.

This combination of springs gives an easy and uniform movement to the body of the car. These trucks are so arranged with proper connection to the body bolster of the car as to allow the trucks to swivel freely and pass the shortest of curves without difficulty. At the center of the truck are two cross bars to which are fastened the motor supports, and which can be adapted to any kind of motor used.

The same remarks made above in the description of the Class G trucks are equally applicable to the Class H truck; the brakes on these are very simple, and easily kept in repair. Braking power being equally distributed on all wheels, the trucks are able to swivel freely when the brake is set. The wheels and axles can be removed from this truck with the same ease as mentioned above for the Class G truck. The truck is compactly built and is made entirely of soft steel and malleable castings.

The manufacturer of this truck has large numbers of each of these classes in use in different parts of the country, and is receiving expressions of the highest praise.

### NEW ATTRACTIONS FOR PLEASURE RESORTS.

Without doubt moving war views are the most popular attractions at the present time, and among the steadiest running of the moving picture machines on the market is the "Critereoscope," manufactured by J. B. Colt & Co. One of the most important features about the "Critereoscope" is that it may be disconnected from the lantern in a few seconds and regular lantern slides substituted for the "living" films, so that for a moderate outlay an exceedingly attrac-

tive entertainment can be presented. This firm has just moved to greatly enlarged quarters in the new Bancroft building, 3 to 7 West 29th street, New York, and carries an extensive line of pleasure park attractions. A visit to their salesrooms would impress any one with the fact that they are leaders in their line. Among the goods they offer are some of especial interest to street railways controlling pleasure parks, such as the "Critereoscope" and acetylene search lights, which are admirably adapted to illuminating out-door performances and theater stage lighting. The search lights just referred to are also suitable for furnishing light at night for repairing tracks or wherever a strong light is required, being portable, convenient and economical. Further information will be furnished on application.

### CREOSOTED WOOD CONDUITS.

It is a fact long known that wood which is kept continuously wet or dry will last for centuries, but when alternately damp and dry it soon decays. Perhaps the most successful preservative that has yet been used is the dead oil of coal tar with which Bethell experimented as early as 1838. This creosote oil is a distillate of coal tar and is thick, gummy and insoluble, filling the pores of the wood and protecting it from moisture. The Michigan Pipe Company, of Bay City, Mich., is the manufacturer of creosoted wood conduits,



poles, etc. The accompanying illustrations show the ends of sections when ready to be joined. These conduits need no concrete foundation, but only a creosoted plank above and below them, and they are not only cheap and easy of construction but protect the lines in the most effective way. Creosoted poles, cross arms and ties are also manufactured. A wooden casing for steam pipes has proved to effect a great saving in power stations and on steam lines.

### THE PATTON MOTOR AT CEDAR FALLS.

Our correspondent at Cedar Falls, Iowa, under date of May 7, writes that the Patton motor operating on the line in that city is running regularly and doing good work, in spite of miserable condition of the track, which is very rough. This is the machine which, on March 20 and 21, was run with its own power from Chicago to Cedar Falls over the track of the Chicago Great Western road.

Work on the Chicago, Detroit & Toledo Electric Railway was commenced May 1 and its completion is set for October 1. The contract for the roadbed has been let and 400 men are now at work at Monroe.

A conductor and motorman of the Chicago General Railway were held up by two highwaymen and robbed of \$33 and watch. This is the second robbery of train crews near the same point.



**CONDUCTIVITY OF A CAST-WELDED RAIL JOINT AFTER TWO AND ONE-HALF YEARS OF SERVICE.**

In the REVIEW of January last were published the results of a conductivity test made on a new cast-welded rail joint and comparisons made with a bonded joint. J. R. Chapman, chief of the electrical department of the North and West Chicago Street Railroad companies, has watched for an opportunity to test a joint that has been in service for some time. A portion of the joints of the Cicero & Proviso Street Railway Company, Chicago, were cast-welded by the Falk Manufacturing Company of Milwaukee, in No-



FALK JOINT TWO AND ONE-HALF YEARS OLD.

vember, 1895. Recently some of this track had to be relaid and Mr. Chapman made a promiscuous selection of a worn-out rail with a cast-welded joint and the results of the tests are given below. One illustration shows a cross section of the joint which was cut as soon as the test was completed. In the other illustration may be seen the rail, about 15 ft. in length, with the connections which were attached to the dynamo terminals at the switchboard.

**EDITOR REVIEW:**

On December 17, 1897, some experiments were made at the California avenue power house of the Chicago Electric Transit Company on the conductivity of cast-welded joints which had not seen service. With the view of ascertaining whether service, and the action of the elements, would have any effect upon a joint of this character, one was selected

from the scrap pile and subjected to a test under the same conditions as that named above.

The rail used was a 4½-in, 56-lb. girder section. The joint was made in the track in 1895 on the Cicero & Proviso Street Railway, several miles of double track street having been repaired in this way at that time. The rail is now badly worn and pieces are occasionally brought into the yard as scrap.

Readings were taken at five-second intervals for one and one-half minutes, the flow of current through the rail being read by one observer and the drop in potential through 5 ft. of the rail was read simultaneously by another observer. The sample tested was of sufficient length so that one section of 5 ft. carried the joint and the other section of 5 ft. was the continuous rail. The same voltmeter leads were used in both cases and were of such large wire that a correction would be trifling.

The result of the experiment as tabulated below indicates that the joint had practically the same conductivity as the rail.

Test No.	Average Amperes Flowing.	Drop in 5 ft. with Joint, Volts.	Drop in 5 ft. without Joint, Volts.	Drop in Volts per 100 Amp. Flowing.
1	502.6	----	.047	.00995
2	508.9	.048	----	.00943
3	735.8	.065	----	.00883
4	758.4	----	.069	.00910

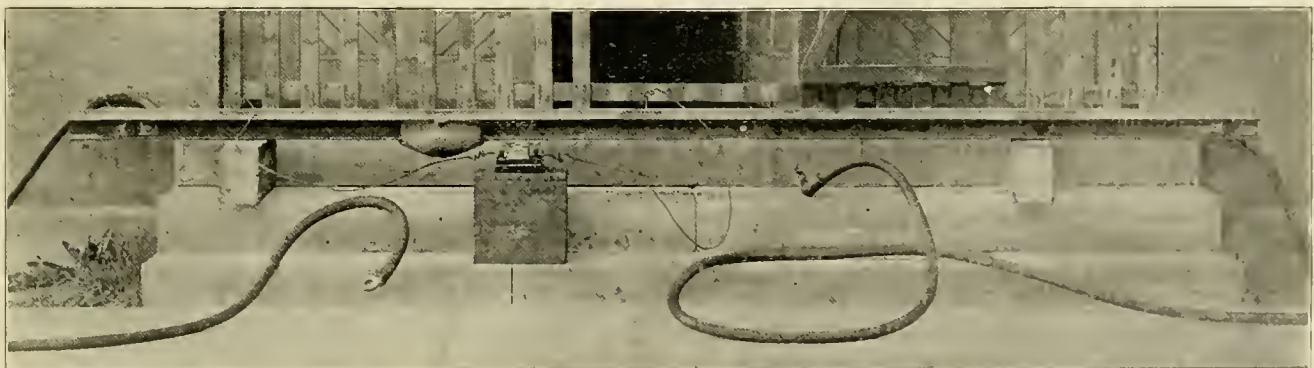
Temperature of rail during tests, 80° F.

JAS. R. CHAPMAN.

Chicago, May 11, 1898.

The test is particularly interesting to engineers, and will be gratifying to the Falk Company, as confirming the position it has always defended, viz., that time and the passage of current through its joint, would not decrease the conductivity of the joint. Many have contended that a certain amount of oxidization was likely to occur on the surface of contact between the joint and the rail. The high efficiency of the tested joint for conductivity, after having been in track and under constant and severe service for two years and a half ought to be sufficient proof that while the railway, from decrease of cross section through wear, gradually lose something of its current carrying capacity, the joint remains unchanged.

While the test confirms what the Falk people have always insisted on, the result will be pleasing to the many managers using cast welded rail joints, if any of them have, to this time, had any doubts.

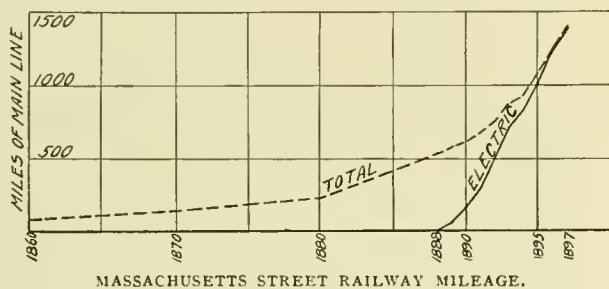


SHOWING METHOD OF TESTING.

**REPORT OF MASSACHUSETTS STREET RAILWAYS.**

The Massachusetts Railroad Commissioners' report giving the returns for 1897 shows that 93 companies reported—10 more than in 1896. At the end of the year, 75 of these 93 companies were operating their railways; the lines of 11 companies were operated by other companies under lease or contract; six companies had organized and paid in a portion of their capital stock, but had not begun to build; and one company had been consolidated with another during the year.

During the year 122.66 miles of main line, 14.26 miles of second main track, and 11.47 miles of side track, making 148.39 miles reckoned as single track, have been added to the street railway mileage reported; all but 2.70 miles of this was newly built. This is an increase of nearly 11 per cent over 1896 and makes the total mileage 1,516.64 miles; all of this except 19.91 miles, which are in Rhode Island, are in Massachusetts. Of the total, 13.15 miles were operated by horse and cable, and 11.95 by horse power only. The diagram illustrates graphically the growth of the street railways from 89 miles in 1860 to 1,414 miles of main track



in 1897; the dotted line is total miles of main track and the full line the miles operated by electricity. In the same period the number of companies has increased from 20 to 93.

The average cost per mile of main track (including cost but not length of side track) is shown by the books of the companies to be \$22,755 for construction, \$9,374 for equipment, and \$12,329 for lands, buildings (including power plants) and other permanent property—making the total \$44,458 per mile of main track. These figures furnish but little clue to the cost of any particular railway, which ranges from \$10,000 in a country town to \$97,000 in Boston.

The average capital investment per mile in 1897 was \$44,683; the average for the last 10 years is \$43,804. For the 10 companies that carry over 4,000,000 passengers a year, the average capital investment is \$52,381 per mile; of these the lowest is \$29,399 for the Holyoke company, and the highest \$100,553 for the West End of Boston.

The gross assets were \$67,509,916 and the gross liabilities \$66,483,144, leaving for surplus and special funds \$1,080,030, which is a decrease in the surplus of \$71,063 as compared with 1896. The surplus for 1897 was 3.14 per cent of the capital; the average for 10 years is 3.41 per cent of the capital.

The gross earnings were \$15,898,839, and the expense of operation \$10,904,040; other expenditures were \$4,366,895, leaving \$627,904 for the surplus accounts.

The total amount of cash dividends declared the last year

was \$1,965,243, an increase of \$162,396.50 over the previous year. One company paid 10 per cent; two paid 9 per cent; ten paid 8 per cent; one paid 8 per cent on preferred and 7.5 per cent on common stock; three paid 7 per cent; fourteen paid 6 per cent; one paid 5.5 per cent; four paid 5 per cent; one paid 4.5 per cent; three paid 4 per cent; one paid 3.75 per cent; one paid 3.5 per cent; three paid 3 per cent; one paid 2.5 per cent; four paid 2 per cent; and 43 companies, new and old, paid no dividends.

*Capital Stock, Net Income and Dividends, 1888-1897.*

YEARS.	Capital Stock.	Net Divisible Income.	Cash Dividends Declared.	Percentage on Total Capital Stock.
1888, . . . . .	\$10,894,850	\$785,008	\$625,617	5.74
1889, . . . . .	12,290,740	1,025,758	838,649	6.82
1890, . . . . .	14,879,130	1,430,116	963,154	6.47
1891, . . . . .	19,553,952	1,299,153	1,100,015	5.63
1892, . . . . .	23,590,536	1,905,680	1,582,697	6.71
1893, . . . . .	25,883,575	1,993,399	1,716,637	6.63
1894, . . . . .	26,971,275	1,812,668	1,610,886	5.97
1895, . . . . .	27,906,685	2,257,355	1,606,196	5.76
1896, . . . . .	30,727,818	2,280,776	1,802,847	5.87
1897, . . . . .	32,670,273	2,593,147	1,965,243	6.02
Averages, . . . . .	\$22,536,883	\$1,738,306	\$1,381,194	6.13

The amount of dividend-paying capital was \$28,425,350, on which the average rate was 6.91 per cent as against 6.82 the previous year. The non-dividend paying capital was \$4,244,922. Including this last, the average rate for the state was 6.02 per cent. As seen from the table which gives the dividends for the last 10 years, this is a slight improve-

*Percentage of Operating Expenses to Gross Earnings, 1888-1897.*

YEARS.	Gross Earnings from Operation.	Operating Expenses.	Percentage of Expenses to Earnings.	Net Earnings.
1888, . . . . .	\$6,824,317	\$5,532,797	81.07	\$1,291,520
1889, . . . . .	7,523,575	5,898,804	78.40	1,624,771
1890, . . . . .	8,348,285	6,244,208	74.80	2,104,077
1891, . . . . .	8,861,841	6,746,304	76.13	2,115,537
1892, . . . . .	9,798,060	7,029,479	71.74	2,768,581
1893, . . . . .	10,832,174	7,501,845	69.26	3,330,329
1894, . . . . .	11,119,846	7,729,059	69.51	3,390,787
1895, . . . . .	13,184,342	9,088,086	68.93	4,096,256
1896, . . . . .	14,844,262	10,563,371	71.16	4,280,891
1897, . . . . .	15,815,267	10,904,040	68.95	4,911,227
Averages, . . . . .	\$10,715,197	\$7,723,799	72.08	\$2,991,398

*Operating Expenses and Net Earnings (Ten Railways) in 1897.*

RAILWAY COMPANIES.	Percentage of Operating Expenses to Gross Earnings.	NET EARNINGS PER			
		Mile of Track Operated	Round Trip Run.	Car Mile Run.	Passenger Carried.
Brookton, . . . . .	62.35	\$9,016	\$0 67	8.32	1.87
Globe (Fall River), . . . . .	67.78	3,786	52	7.68	1.56
Holyoke, . . . . .	68.72	2,369	53	6.98	1.51
Lowell, Lawrence & Haverhill, . . . . .	55.87	3,272	1 25	11.86	2.22
Lowell & Suburban, . . . . .	61.95	2,487	52	8.06	1.92
Lynn & Boston, . . . . .	57.44	3,967	1 16	11.07	2.21
Springfield, . . . . .	72.65	2,494	53	5.52	1.38
Union (New Bedford, etc.), . . . . .	67.81	4,496	46	9.23	1.75
West End (Boston, etc.), . . . . .	71.26	9,395	85	8.41	1.45
Worcester Consolidated, . . . . .	74.79	3,067	38	6.32	1.28
Averages, . . . . .	68.79	\$5,454	\$0 79	8.54	1.58



ment over the previous three years, but is below the average for the decade.

The total number of passengers carried during the year ending September 30, 1897, was 308,684,224, an increase of 5.6 per cent over the previous year; the car-miles run were 61,577,917, an increase of 15 per cent; the round trips were 6,557,183, an increase of 9.2 per cent; the average passengers per round trip were 47 as against 49 the previous year. Of the 10 large roads the Union, of New Bedford, had the lowest number of passengers per round trip, 26; and the West End road the highest, 58; the average for the ten roads was 50.

The tables give interesting data as to the percentage of operating expenses to gross earnings for the last ten years, the operating expenses and net earnings of the ten large companies for 1897, and the gross and net earnings per mile of main track owned, per round trip, per car-mile, and per passenger.

In analyzing the effect of the density of traffic upon the earning capacity, shown in the table, the roads are divided into three classes and compared with the Metropolitan Company, the most important of the merged predecessors of the West End. These three classes omit the fifteen companies which had been in operation for less than a year, and include the West End (including the Somerville), which constitutes a class by itself; the second class comprises the 48 other companies which paid dividends; the third class comprises the 28 companies which did not pay dividends.

*Gross and Net Earnings from Operation per Mile of Main Track Owned and per Round Trip Run, 1888-1897.*

YEARS.	AVERAGE PER MILE OF TRACK.			AVERAGE PER ROUND TRIP.		
	Gross Earnings.	Expenses of Operation.	Net Earnings.	Gross Earnings.	Expenses of Operation.	Net Earnings.
1888, . . . .	\$12,789	\$10,369	\$2,420	\$2 12	\$1 72	\$0 40
1889, . . . .	13,103	10,274	2,829	2 18	1 71	0 47
1890, . . . .	13,632	10,197	3,435	2 22	1 66	0 56
1891, . . . .	13,178	10,032	3,146	2 24	1 70	0 54
1892, . . . .	12,980	9,312	3,668	2 35	1 69	0 66
1893, . . . .	12,392	8,582	3,810	2 41	1 67	0 74
1894, . . . .	11,972	8,321	3,651	2 39	1 66	0 73
1895, . . . .	12,127	8,359	3,768	2 55	1 75	0 80
1896, . . . .	11,627	8,274	3,353	2 47	1 76	0 71
1897, . . . .	11,187	7,713	3,474	2 41	1 66	0 75
Averages, . .	\$12,290	\$8,859	\$3,431	\$2 36	\$1 70	\$0 66

*Gross and Net Earnings from Operation per Car Mile Run and per Passenger Carried, 1888-1897.*

YEARS.	AVERAGE PER CAR MILE			AVERAGE PER PASSENGER.		
	Gross Earnings.	Expenses of Operation.	Net Earnings.	Gross Earnings.	Expenses of Operation.	Net Earnings.
1888, . . . .	Cents. 29.36	Cents. 23.80	Cents. 5.56	Cents. 5.07	Cents. 4.11	Cents. .96
1889, . . . .	30.98	25.71	5.27	5.07	3.98	1.09
1890, . . . .	31.48	23.87	7.61	5.06	3.79	1.27
1891, . . . .	32.03	24.38	7.65	5.03	3.83	1.20
1892, . . . .	33.01	23.69	9.32	5.05	3.62	1.43
1893, . . . .	31.39	21.74	9.65	5.07	3.51	1.56
1894, . . . .	30.28	21.05	9.23	5.04	3.50	1.54
1895, . . . .	30.20	20.82	9.38	5.07	3.50	1.57
1896, . . . .	27.69	19.70	7.99	5.08	3.61	1.47
1897, . . . .	25.68	17.71	7.97	5.12	3.53	1.59
Averages, . .	29.64	21.37	8.27	5.07	3.66	1.41

*Density of Traffic as affecting Earning Capacity.*

RAILWAY COMPANIES.	Miles Operated.	Capital Investment per Mile Operated.	Passengers per Mile Operated.	Passengers per \$1,000 of Capital Investment.	Per Cent of Dividend Paid
Metropolitan, <sup>1</sup> . . . .	90.88	\$38,903	472,850	12,150	10.00
West End, <sup>2</sup> . . . .	266.67	97,631	647,083	6,628	7.69 <sup>3</sup>
48 companies, <sup>4</sup> . . . .	880.59	33,785	135,616	4,014	5.68
28 companies, <sup>5</sup> . . . .	209.69	28,004	70,895	2,532	-

<sup>1</sup> In 1887. Other companies, in 1897.  
<sup>2</sup> Including the Somerville, operated and practically owned by the West End.  
<sup>3</sup> Average dividend on total preferred and common stock.  
<sup>4</sup> Includes all the companies (except the West End and the Somerville) whose railways had been operated more than a year, and which paid dividends in 1897.  
<sup>5</sup> Includes the companies whose railways had been operated more than a year, but which paid no dividends in 1897.

The 28 companies had been in operation on an average about five years; and the 48 companies a considerably longer time. Based on these figures it is said: "An intending investor in an existing or projected street railway enterprise, will take into account the chances in a series of years of a management and success a little below as well as above the general average. If he desires a regular annual return of 6 per cent on his shares, he ought to be convinced, we think, that the railway will carry year in and year out more than 135,616 passengers per mile operated, and more than 4,014 passengers per \$1,000 of capital investment; otherwise, the probabilities, based on the experience of 48 companies, are that he must be content with a smaller return. Unless it can be demonstrated, moreover, that the railway will carry year in and year out more than 70,895 passengers per mile operated, and more than 2,532 passengers per \$1,000 of capital investment, the chances, as proved by the experience of 28 companies, are that he will receive no dividend at all."

And what is equally important, while the difference between 2,500 passengers and 4,000 passengers per \$1,000 invested is the difference between nothing and 6 per cent in dividends, the data for the West End show that the difference between 4,000 and 6,600 passengers per \$1,000 invested is only two per cent in dividends.

## VANDALS AT HOUSTON, TEXAS.

On the night of April 16 several crude bombs were placed on the tracks of the Houston (Tex.) Electric Street Railway Company. They consisted of soda pop bottles partially filled with powder with a fuse of paper, having parlor matches in the exposed end. One of the bombs was exploded by a car; the rear trucks were lifted off the rail and the car filled with smoke, but no other damage was done.

A week later the attempt to wreck cars by placing explosives on the tracks was repeated. Between the hours of 10 and 12 on the night of April 23, there were five very loud explosions and several of lesser force; the bombs were placed on three of the lines in different parts of the city. The explosions were of greater force than those of the week before and a number of car wheels were broken. The cars were in every instance, except one, filled with passengers and it is fortunate that no one was injured.

The management of the company has offered a reward of \$500 for the arrest and conviction of any of the guilty parties.

## ECHOES FROM THE TRADE

At the Electric Exhibition, Madison Square Garden, one of the exhibits is the Engineering Picture Gallery, which is a new feature of great interest. It comprises a series of eight illustrative and historical wax tableaux, prepared by Dr. Park Benjamin, Prof. F. B. Crocker and T. C. Martin, executed and arranged by the Eden Musee Company. The series includes the First Recognition of an Electric Effect, when the Syrian woman wonderingly perceived light objects flying to her amber spindle; the Mariner's Compass, ascribed to the Chinese and Italians, but probably to be credited to the Finns, in the 11th century; the Earth a Great Magnet, William Gilbert explaining the Terrella to Queen Elizabeth, 1600; the First Conductors or Circuits; Stephen Gray, a Charter-House pensioner in London (1720), experimenting on the conduction of electricity; The Leyden Jar, showing the bottling of electricity and the terrible shock to Dean Von Kleist, Canon of the Cathedral in Cumin, in Pomerania, 1746; The Identity of Lightning and Electricity—when Benjamin Franklin drew down the lightning from the skies, 1752; The Beginnings of the Modern Primary Battery or Voltaic Cell, with Galvani's famous frog experiment, 1791; and the Beginnings of Modern Dynamo-Electric Machinery, showing Michael Faraday's famous experiment, 1831.

Among the notable exhibits are several pertaining to the street railway field.

At the exhibit of the Peckham Truck Company are shown one 14-B short wheel base swivel truck and one of the 14-D swing bolster maximum traction trucks. A Metropolitan special high speed single truck car is displayed. The truck is notable for its long spring base which prevents oscillation, and its rigid center brace which removes the strain of keeping the truck square with the car body. The John Stephenson Company made the car body, and in addition to this it has an exhibit of a model car one-quarter size, which shows all the operations of the conduit system of the Metropolitan Street Railway Company. The Peckham Truck Company also has a 7-B-X excelsior truck in the exhibit of the Walker Company. This truck shows a different arrangement of the cantilever side frame design, a characteristic feature of the single trucks of this company.

In the exhibition of the Walker Company there are two of the new No. 20 L motors mounted; one of the same type dismantled to show construction; two No. 4-A street car motors mounted; type "S" controllers, assembled and dismantled; a street railway switchboard with generator and feeder panels; the new Walker recording wattmeter; a section of the conduit system with a Broadway car in operation; a 50-k. w. belted alternator, and a 50-k. w. lighting generator direct connected to an Armington & Sims engine.

H. B. Coho & Co., of New York, have a fine exhibit of switchboards, panel boards, etc., a 75-k. w. alternator operated by a direct current motor and generating current at 100 and 1,100 volts. In addition the firm represents the American Rheostat Company, the Warren Electric Manufacturing Company, the Eddy Electric Manufacturing Company, the Crown Woven Wire Brush Company, the Otis Electric Company, the Pennsylvania Electric Company and others.

The exhibit of the American Ball Engine Company consists of one of the company's engines direct connected to a 25-k. w. dynamo, which furnished current for an elaborate lighting exhibit and for a multipolar motor, being a complete generating and distributing plant, with applications of current for light and power.

The Samson Cordage Works have sample coils of the "Samson Spot" waterproof cord for trolley, bell and arc lamp purposes.

This display is neatly arranged in a show case in a conspicuous place and attracts much attention.

The Fuel Economizer Company, of Matteawan, N. Y., exhibits a complete economizer set up with sectional asbestos covers, and scrapers for removing soot as though it were in actual service with a 150-h. p. boiler. There are also sections of pipes and headers showing various methods of making joints, and a complete working model with prints and photographs showing installations in several power stations in New York and Brooklyn.

Elmer P. Morris has a display of railway supplies, car couplings, rail bonds, iron and wooden poles, lightning arresters, gears and pinions. A large number of companies is represented, including the Garion-Daniels Electric Company, Keystone Electrical Instrument Company, Simonds Manufacturing Company, Pittsburg Steel Trolley Pole Company and others.

The Consolidated Car Fender Company makes an exhibit of Providence fenders on a standard car for the electrical conduit system of the Metropolitan Street Railway Company. This type is the standard of the Metropolitan company and is being placed on all the electric cars.

One of the Metropolitan cars at the Exhibition has been fitted with registers, brakes, sand boxes, etc., by the Sterling Supply & Manufacturing Company, of New York.

The Keystone Electrical Instrument Company, of Philadelphia, has a complete exhibition of both switchboard and portable instruments at the Exposition. It includes a slate switchboard on which are mounted a full set of the various switchboard types suitable for use in central stations, street railway power houses and in isolated plants. The exhibit also includes a line of ground detectors and instruments designed for series arc light service. Portable testing instruments are also shown. In connection with this exhibit, is a pair of the type "R" instruments mounted on a panel board, showing them in practical service on a working generator circuit. The exhibit is in charge of Elmer P. Morris, 15 Cortlandt street, New York. President J. F. Stevens, of the Keystone Company, was present at the opening of the Exposition and will spend considerable time at the exhibit during the continuance of the Exposition.

Electric street railway systems, recently completed at Cape Town and Port Elizabeth, South Africa, are largely equipped with machinery of American make. In the power station at Cape Town there are three verticle compound engines direct connected to 300-h. p. Westinghouse generators, and one McIntosh & Seymour tandem compound engine direct connected to a General Electric 525-k. w. generator. The steaming plant consists of four 300-h. p. Heine boilers. The crane and the piping of the station was also furnished by American firms. At Port Elizabeth the station equipment consists of three McIntosh & Seymour compound condensing engines direct connected to 100-k. w. General Electric generators, water tube boilers, condensers and pumps, all of American manufacture. All trolley and feed wire was from the factory of the Washburn & Moen Manufacturing Company. The cars were furnished by the J. G. Brill Company. All these contracts were taken in the face of sharp competition and as a result of the prices quoted and the excellent workmanship.

James Partridge, of the Partridge Carbon Company, represents that firm at the Electrical Exhibition and displayed the self lubricating motor and generator brushes made by the company.

Forde Bain, consulting engineer and registered solicitor of patents, has prepared a small vest pocket manual of "Useful Infor-



mation for Practical People," copies of which he has sent to his friends. A limited number of extra copies will be sent postpaid on receipt of five 2-cent stamps.

The International Construction Company, of Detroit, Mich., has lately sent out a neat little booklet entitled "Questions and Answers," giving much valuable information on the cost and material for electric railways. Many convenient and useful tables may also be found.

The New York Electrical Works on May 1 removed to 515-521 Kent avenue, Brooklyn, where, with facilities largely increased they will continue to manufacture standard and special types of trolley fittings. The new shops are equipped throughout with new machinery.

The Standard Underground Cable Company, of Pittsburg, has received a rush order for \$50,000 worth of insulated cable to be used for coast war operations.

The Lorain Steel Company, of Lorain, O., has contracted for 10,500 h. p. of water tube boilers of the Cahall make for its new extensions; 2,500 h. p. of these boilers will be equipped with the Cahall chain grate stoker.

The Peckham Motor Truck & Wheel Company reports that its business this spring is larger than ever before and that to fill orders it has been necessary to put on a regular night crew. The company is making shipments to the following points: Middleboro, Bradford, Coventry and Plymouth, Eng.; Buenos Ayres; Cork and Dublin, Ireland; Zurich, Switzerland; Cleveland, Dayton, Cincinnati and Jewett, O.; New York City, Auburn and New Platz, N. Y.; Natick, Bridgewater, Haverhill, Quincy, Hyde Park, Salem, Fall River and Attleboro, Mass.; Omaha, Neb.; Council Bluffs, Ia.; St. Louis and Webb City, Mo.; Jersey City and Hoboken, N. J.; Indianapolis; Oakland, Cal.; Newport, R. I.; Milwaukee; Bradford, Pa.; Joliet, Ill.; Pensacola, Fla.; Pueblo, Cal.; Meriden, Conn.; Lewiston, Me.

The General Electric Company has just published a very handsomely illustrated pamphlet describing the various types of direct and alternating current lightning arresters.

The Chicago Fuse Wire & Manufacturing Company has entirely re-equipped its factory which was destroyed by fire January 28, and is in better condition than ever before for filling orders for tested fuse wire and links. All fuse wire sent out after May 1 will be packed on trade mark spools and these placed in tin boxes to protect the wire from abrasion. The company carries a full stock of all sizes of wire, strip and links, and shipments are made from the factory in Chicago or from the eastern office, 853 Broadway, New York. W. R. Goodman, manager of the company, says that the great consideration shown the company by its friends in the trade during a few weeks of enforced suspension of business after the fire, is highly appreciated.

W. D. Ray, recently manager of the Everett (Wash.) Electric Railway, has accepted the position of traveling sales agent for Littlefield & Meysenburg, western agents of the Johnson Company. Mr. Ray will handle Steel motors, Dupont trucks and other street railway supplies manufactured by the Johnson company.

Some figures in connection with the new edition of the Electric Light Supply Catalog recently issued by the Western Electric Company may be interesting. The edition weighs 20,000 lbs.; if the catalogs were piled on top of each other they would make a column 1,000 ft. high; and if placed upon the ground end to end they would form a line 6,666 ft. long. The edition is complete containing every well-known device that is used in electric light construction and is so carefully indexed that articles can be found under several headings. Copies will be furnished to the trade upon application.

Albert B. Herrick, consulting engineer, has changed his offices from 150 Nassau street to 120 Liberty street, where he will be

nearer his clients and have more space for increased business.

The Metropolitan Street Railway Company, of Kansas City, Mo., has awarded contracts to the American Construction Company, of Chicago, for one mile of double track and for the welding of 6,000 rail joints. The rails weigh 103 lbs. each and will be welded together.

Kohler Brothers, sales agents for electrical machinery and appliances, in April took the agency for the Northern Electrical Manufacturing Company, of Madison, Wis., for the states of Illinois, Iowa, Missouri, Indiana, Nebraska, Kansas, Kentucky, Tennessee, Michigan, Ohio, Pennsylvania, New Jersey, Maryland, Delaware and District of Columbia; and are now prepared to figure on all kinds of direct current electrical apparatus up to 250 k. w.

The Murray Iron Works Company, of Burlington, Ia., has just published a circular showing half-tone engravings of five domeless, high pressure, tubular boilers adapted to different settings. Attention is called to the necessity of good workmanship on boilers and to the superior facilities possessed by this company.

We have received the sixth annual report of the General Electric Company, showing the business for the year ending January 31, 1898, and including the reports of the executive officers to the stockholders as presented at the annual meeting held May 10. The gross earnings were \$12,524,938; expenses, \$10,727,692; net earnings and net income from securities owned, \$1,853,702. After deducting losses, amounts written off, and \$250,000 reserve for extensions, amounting to \$621,849, there was left \$1,231,852 to apply on the deficit of previous years. In the railway department the money value of the orders for railway apparatus received showed an increase of one-third over 1896. The orders for railway generators aggregated over 60,000 k. w. The average size of the railway motor has increased to 34.7 h. p., while the average railway generator for 1897 was 484.3 h. p. as against 356.3 h. p. in 1896. Among the important railway contracts secured during the year were those for the equipment of the Metropolitan, of New York; the large motor order for the Boston Elevated; and the contract for the substitution of electric traction for cable traction on the lines of the Capital Traction Company, Washington.

The Hoppes Manufacturing Company, of Springfield, O., well known as the manufacturers of the Hoppes live steam feed water purifier and the Hoppes exhaust steam feed water heater, has placed upon the market a new separator, having some new points of interest, a description of which will be found on another page in this issue. This company also manufactures separators and receivers of large dimensions built on the same plan of the separator, and oil eliminators and grease extractors for exhaust steam. A new illustrated catalog is in press and will soon be ready for distribution.

The center of geographical interest is now in the West Indies and the Sargent Company, of Chicago, has aptly taken advantage of this by issuing a set of maps showing the Island of Cuba, the group of islands and the world. The maps are printed in several colors and will prove to be a timely addition to any office. They will be sent to railway men on application.

The shafts for the great engines to be installed in the power station of the Metropolitan Traction Company, of New York, are to be built by the Bethlehem Iron Company. Each shaft will be 37 in. in diameter, 27 ft. 4 in. long with a 16-in. hole through the center. They are to be made of fluid compressed, open hearth steel, annealed and hydraulically forged on a mandrel. This company is the only one in the country which has forges equipped for turning out work of this character and magnitude. The company has very large contracts with the government for guns and gun-carriages and many orders are coming in from private concerns for shafting of all descriptions, both solid and hollow, plain steel and nickel steel. The foreign business has been very extensive, contracts for armor plate for the Russian government are being filled, and prices have been asked on shafting for Japanese war vessels.

The Lake Shore & Michigan Southern Railway Company has just issued an illustrated pamphlet on "The Union Elevated Loop in Chicago;" also a specially prepared map giving a bird's eye view of the Loop and all the elevated railway systems in the city. Every car of all the elevated lines stops in front of the Lake Shore station on Van Buren street, thus affording unequalled facilities for passengers to pass directly from the steam cars to the elevated trains for any part of the city. This station is the Chicago terminus of the "Lake Shore Limited," the most beautiful train in the country, making the run daily to New York in 24 hours.

The motormen, conductors and gripmen of the North Chicago Street Railroad Company are being fitted with new uniforms which are more than usually attractive. The uniform is made of blue cloth from the Warrentown Woolen Company and the coat has a velvet collar with the monogram of the company worked in gold braid near one corner. The company is having gilt service stripes sewed to the sleeves of each employe who has been with the company five years or more. C. F. Orr & Co., 130 La Salle street, Chicago, are making the suits. This same firm is also making uniforms for the West Chicago Street Railroad Company and the Chicago City Railway Company. The latter company will have its employes provide summer as well as winter suits, and these will be made of much lighter material.

Alonzo G. Collins, of Milwaukee, consulting, mechanical and architectural engineer, has removed his office from No. 608 Pabst building to No. 1301 the same building. Mr. Collins makes a specialty of electric light and railway power houses and also of ice-making and cold storage machinery.

On May 1, Rossiter, Mac Govern & Co., removed their principal office to the new Washington Life building, 141 Broadway, New York, and hereafter their entire stock will be carried at their Newark factory and repair shop, 35-37 New Jersey Railroad Avenue. Facilities have been added which enable them to display a large and very attractive stock of electrical machinery.

The Bradford Belting Company, Cincinnati, O., has received from Elmer P. Morris, its New York agent, 15 Cortlandt street, an order for a belt 160 ft. long, 6 ft. 8 in. wide, three hides thick for the enlargement of the Jersey City plant of the People's Light & Power Company. This is the second belt of this size supplied by the Bradford company to the Jersey City plant, and the two are probably the largest belts running under one roof anywhere the world over. The Bradford company is also just equipping the enlarged plant at Norfolk, Va., and has belts 6 ft. wide and over running in many places.

The Westinghouse Electric & Manufacturing Company is to supply the electrical apparatus for the new plant of the Detroit, Ypsilanti & Ann Arbor Railroad Company, consisting of four 300-h. p. generators, three boosters, switchboards, and 10 car equipments, including 40 50-h. p. motors.

Eugene Munsell & Company, and the Mica Insulator Company, of New York and Chicago, have completed arrangements with the George Worthington Company, of Cleveland, to become distributors of "mica" and "micanite." The territory includes the city of Cleveland and adjoining counties. A large stock of India and amber "mica," in the sheet and segments for railway motors, as well as "micanite" plate, segments, rings, cloth, paper, etc., will be carried to supply the electrical trade in that section. Some large orders have been received lately, one for 800 lbs. of mica segments having been received from one railway company.

Wendell, Fay & Co., of New York, have received an order from the Postal Telegraph Cable Company for supplying uniform cloth for the latter company's entire force. Wendell, Fay & Co. have for a number of years supplied all the uniforms for the Postal Telegraph Cable Company, and this order speaks well for the satisfaction which this cloth has given. The color which has hitherto been used for the uniforms of the Postal Telegraph Cable Company has been cadet grey, but the new uniforms will be a sky blue. Large orders for Middlesex cloth have been filled for the use of the United States government.

The Consolidated Street Railway Company, of Grand Rapids, has adopted the Providence fender as a standard after investigating nearly every other make and trying many models on its cars. The Consolidated Car Fender Company will soon complete the delivery of the Grand Rapids order which was for 140 fenders.

The firm of Hill & Howard has been formed to do a general consulting engineering business, and is now located at 35 Manufacturers' Record Building, Baltimore. The firm will furnish plans, specifications, reports, estimates, tests, etc., for water works systems, electrical subways, electric light and power plants and for the transmission of power. Nicholas S. Hill, Jr., is a graduate of the Stevens Institute of Technology, was mechanical engineer of the South Side Elevated Railroad, of Chicago, engineer-secretary of the Sewerage Commission of Baltimore, and chief engineer of the water department. The latter position he has just resigned to take up his new line of work. B. C. Howard is a graduate of Johns Hopkins University in the electrical engineering department, and became secretary and treasurer of the McCay-Howard Engineering Company, general contractor for electrical work.

The Hansell Spring Company has been increasing its business so rapidly it is forced, a second time in two years, to seek larger quarters, and has removed its works and general office from Newark to Ambler, Pa., a suburb of Philadelphia. It is already running in all departments in the new location and full of orders. Two western agencies have been established: J. C. Carry, 1301 Fisher building, Chicago, and L. Scofield, 116 Spruce street, Detroit.

The W. R. Garton Company, of Chicago, reports that business is opening up in splendid shape and that it has closed several yearly contracts. The company is the agent for the Central Union Brass Company, the Keystone Electrical Instrument Company, the Crouse-Hinds Electric Company, the Duquesne Forge Company, the Pittsburg Steel Hollow-Ware Company, the Massachusetts Chemical Company, the Billings & Spencer Company, C. S. Knowles, the United Electric Improvement Company, William E. Kline & Co., Garton lightning arresters, Raster carbon rheostats, Bound Brook trolley bushings, Pittsburg trolley poles, and Morrell's commutator bars, and thus fully prepared to meet the wants of street railways. Some large orders for Keystone instruments and Raster rheostats have been closed, and many street railways are adopting "Armalac" and "Enamelac" as standard insulating paints.

The employes of the Patterson (N. J.) Street Railway, of which Vice-President Hobart is the president, decorated the cars with flags and red, white and blue bunting in celebration of Dewey's victory.

The Pennsylvania Traction Company, of Lancaster, Pa., is making some extensive improvements at Conestoga Park which will add to its attractiveness for the coming season. Brook's Chicago Marine Band gave two concerts at this park on the afternoon and evening of May 12.

The Springfield (Mass.) Street Railway Company has recently moved into new quarters opposite those formerly occupied. When the old offices were fitted up 15 years ago, many of the stockholders thought the management had been extravagant and built on too large lines but they have been happily disappointed.

The Baltimore City Passenger Railway Company has completed the overhead construction on its "Red" and "White" cable lines, and ordered the car equipments, Westinghouse No. 49. As soon as the power house is completed these lines will be operated electrically and the cable will be a thing of the past in Baltimore.



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OF EVERY DESCRIPTION.***We carry a Large and Complete Stock of Everything needed for the Construction,  
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The property owners of Union county, N. J., who object to the construction of a trolley line between Elizabeth and Plainfield along North avenue, have organized themselves into the "Union County League." They propose to fight the provision of the Squire electric railway law which stipulates that the franchises shall be sold by the Board of Freeholders.

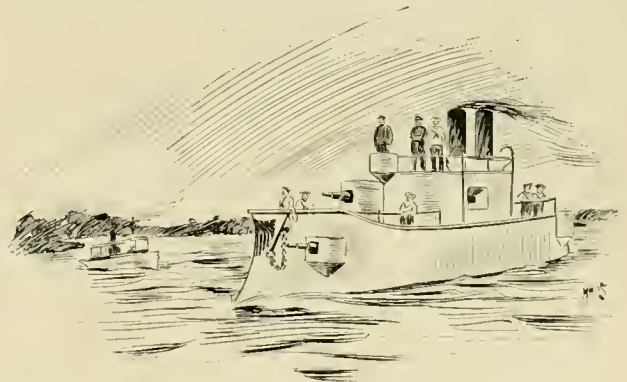
The Metropolitan West Side Elevated Railroad Company has just distributed folders giving some popular information in reference to the road. This was the pioneer among electric elevated railroads and no expense has been spared in substantial construction and in equipment to insure the safety and comfort of passengers. Statistics show that but one passenger in 7,374,790 is injured, which makes such travel 43 times safer than street railways and 215 times safer than on steam roads. A map is given of the city showing the route of the four branches of the company. On the reverse side is a map of the heart of Chicago, the principal hotels, railroad stations, office buildings, department stores and places of amusements, being indicated in different colors. General Manager Baker is to be congratulated on the taste and usefulness of this publication.

**OPEN CARS WANTED**

G. B. Kerper, general manager and purchasing agent of the Peoples' Railway Company, Dayton, Ohio, advises us that he wishes to buy eight 7-bench or 8-bench open cars of standard gage suitable for trailers.

**IN HER ELEMENT.**

The trolley gun-boat "McKinley," which attracted so much attention during the 1896 campaign, and was illustrated in the REVIEW, December, 1896, now rides at anchor in the lake at Whalom Park, the magnificent pleasure resort owned and operated by the Fitchburg & Leominster (Mass.)



THE M'KINLEY.

Street Railway Company. The illustration showing the "McKinley" is redrawn from one of the views in a handsomely illustrated pamphlet descriptive of the park which was sent us by the superintendent, W. W. Sargent.

Joseph Church, the first superintendent of the People's Street Railway in Scranton, Pa., died in Providence, a suburb of Scranton, at the advanced age of 71 years.

### DEVICE FOR PRELIMINARY SURVEYS.

The accompanying illustrations show an instrument for delineating topographical peculiarities and measuring and recording distances, invented by John Riddell, of the General Electric Company, Schenectady, N. Y. This device is for making the preliminary surveys of military, civil and railroad engineers, and doing the work quickly and at small cost; the instrument makes its own record and a profile is obtained by merely traversing the ground. This device may be attached to any wheeled vehicle, however propelled; the illustration shows it mounted on the horizontal upper bar of a bicycle frame.

It consists, briefly, of a vertical revolving cylinder carrying the record, and a marker moved upwards and downwards by the inclination upwards or downwards of the upper bicycle bar. The metal cylinder carrying the paper for the record is provided at the lower end with a worm wheel engaging with a worm on a shaft running toward the rear of the bicycle and driven by a lace belt from a pulley on the crank shaft. Movement of the bicycle produces, therefore, revolution of the record cylinder, which, as it revolves, unwinds the paper for the record from a small drum. The

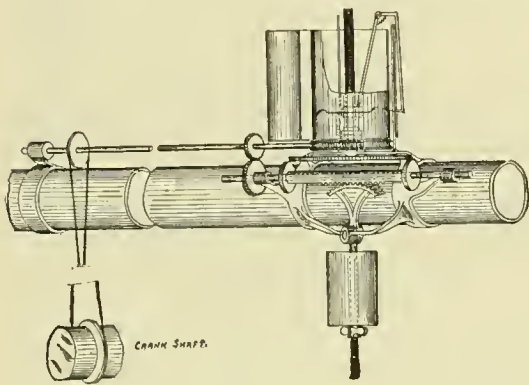


FIG. 1.

marker is mounted on a nut on a threaded vertical rod, movement of which raises or depresses the nut and the marking point. The lower end of the rod is fastened to a horizontal disc free to move clockwise or the reverse. Beneath the disc, and just clearing it on each side, are two small discs, at each end of a toothed sleeve, and revolving vertically. Through the sleeve passes the disc shaft provided with a gear wheel meshing into a small gear on the main shaft driven from the crank axle.

Suspended beneath the bar of the bicycle, and consequently beneath the entire machine, is a pendulum having at its upper end a toothed quadrant, meshing into the teeth of the sleeve on the shaft carrying the vertical discs. As the small discs revolve in the same direction, one in contact with the large horizontal disc revolves it clockwise and causes the marker to ascend, the other counter clockwise depressing the marker. The nearer the center of the large disc, the small disc comes, the faster the former moves and the sharper the angle described by the marker. It will be seen that the pendulum hangs vertically whatever be the angle of inclination of the bicycle. If the machine is ascending, the horizontal bar assumes an obtuse angular position to the pendulum, the rear vertical disc is brought beneath the horizontal disc and the marker moves upward;

if a declivity is descended the angle of the bar and the pendulum becomes acute, the forward disc comes into play and the marker moves downward. On the level both vertical discs are out of contact with the horizontal disc and the marker records a plain horizontal straight line.

A part of a record is shown in Fig. 2. The number of feet above the level are shown by the horizontal line, the distance travelled by the length of the record. It is part of a record made on a wheel ridden from the gates of the General Electric Company's factory to the main street of Schenectady.

### 500 CAR WHEELS A DAY.

The Pennsylvania Car Wheel Company was chartered on January 14 and in less than 90 days finished car wheels were turned out from the company's plant. Within that time five acres of land were secured in Allegheny on the banks of the Ohio river and adjoining the tracks of the Pennsylvania and the Pittsburg & Western railroads. The main building, 70x277 ft., was erected: also buildings adjacent for store rooms, pattern shop, power house and offices. The preparations were so well made that in the first run of 20 wheels no defective ones appeared. High grade cast iron wheels both for street railways and railroads are made. At present 200 men are employed and 500 wheels are cast a day. The officers of the company are: President, Joshua W. Rhodes; vice president, W. L. El-

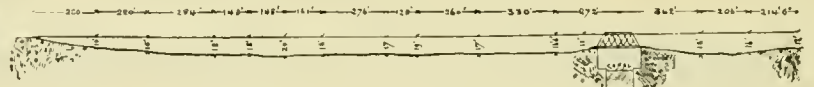


FIG. 2.

kins; secretary and treasurer, C. V. Slocum; superintendent, A. W. Slocum; sales agent, Pittsburg district, J. D. Rhodes; Philadelphia district, J. H. Yardley. The first five were the incorporators of the company. Mr. Rhodes, formerly of the Pittsburg Car Wheel Company, was the prime mover in the organization of the new concern. In his wide experience in selling wheels within 500 miles of Pittsburg, he found it one of the largest fields for the use of car wheels in the country. It seemed to him that Pittsburg should export not import wheels. He acted on the thought, and the result is the splendid plant of the Pennsylvania Car Wheel Company, which will undoubtedly secure a large share of the business in Pennsylvania and New York.

### STREET RAILWAYS IN HAWAII.

The question of rapid transit is agitating the city of Honolulu, and advices indicate that the Hawaiian Government will press the subject. There is now before the House a bill extending the franchise of the Honolulu Tramway Company and also one relating to a new company which it is proposed to organize. The government wishes to make a number of amendments to the bill and has asked that its consideration be postponed.

William Brophy, formerly head inspector of the Staten Island Electric Railroad Company, will soon leave for Mexico to take charge of an electric railway project.





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#### CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

#### DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supply or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that supply. We make no charge for publishing such notices in our DAILY BULLETIN.

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We have at various times commented upon the advantages of electric traction for handling the trains of steam roads at the terminals in large cities, and pointed out that this is probably the most promising field for the application of electricity on such roads. The plans of the Orleans Railroad, of France, for a line connecting its present Paris terminal with a station in a more central part of the city contemplate its operation by electricity; and this is the most recent instance of the appreciation of this motive power for such purposes. This undertaking involves an expenditure of eight million dollars.

For several years the Sunday issues of the daily papers of our large cities have had as a feature an article or a number of articles on scientific subjects, and almost without exception in them accuracy is sacrificed to sensationalism. In many instances the reader knows that the whole thing is a "pipe story" and no harm is done, but sometimes the writer goes so far as to cite authorities, and then the man quoted must come to the front with a denial in order to prevent himself from being the laughing stock of those who know something of the subject. A recent example of such a sensational story is that on the destruction of steel in building foundations by electrolysis, which was published by a Chicago daily. Gen. Wm. Sooy Smith was quoted, and by reason of his prominence in the engineering

profession the article excited much apprehension in the minds of those whose property would be threatened, were the danger real; General Smith has received a number of inquiries from parties owning buildings in Chicago, who had thus had their fears needlessly aroused, and has been much mortified because of the position in which he has been placed. The card from him on another page explains itself.

The daily press of Chicago is now waging war on the street railway interests, and it is quite probable that the article in question was published with a view to arousing antagonism to the street railways on the part of that portion of the public which takes its science from the Sunday paper.

Investors are looking with increasing favor on street railway and interurban securities, and the history of the past year has been such as to warrant this confidence. Much better judgment is being displayed by promoters in projecting new lines than was the case a few years ago when they killed the goose by offering properties which were built long in advance of a supporting demand. Interurbans especially are attracting attention, and will continue to do so as their need and possibilities are better understood. With the freight carrying feature such roads can and actually do create a large business which is impossible to duplicate on urban lines, where the earning capabilities are necessarily limited to the population. Interurbans, on the contrary, are able to create a demand for freight products of which there previously was neither a supply nor demand.

We often hear the manager of a railway or the superintendent of its shop say, when asked as to what make of such and such a thing he uses, "We make them all ourselves, as we find we can make them cheaper." The patent argument in favor of this claim is plausible; by making its own supplies the company saves the cost of putting them on the market and selling them, a large item. But, on the other hand, the manufacturer has a larger plant, and a subdivision of labor as complete as possible, giving the greatest efficiency; he purchases in large quantities; he has great skill and experience (if he is successful); and these things in the aggregate should enable him to save more in the making than he must spend in the selling of his goods.

When the manager says that "he can make it cheaper," he believes himself to be stating the truth, yet that may or may not be the case. It all depends on whether he keeps his shop costs correctly.

We know a company that by its books showed a considerable saving, but when the figures were analyzed it was found that the saving was due to using scrap altogether while specifying new material in the purchased article (the manufacturer would gladly have used scrap, had he been allowed), and moreover that very scrap was charged in at 25 per cent less than the manufacturer would have agreed to pay for it. This effectually wiped out the saving, and in fact left a considerable loss.

The foregoing is merely an instance showing the necessity of keeping shop costs in a manner which will show the whole truth if accurate deductions are to be made from them for the benefit of the company. There is probably no difference of opinion as to such a method being desirable, but there is in practice the widest variation as to methods, and as to the value of the results obtained by them.

A visiting Briton recently facetiously remarked "In my country if one person a year is killed at a grade crossing, the Board of Trade talk of revoking the company's charter; while here you keep ambulances to gather up the dead." Without any intention to make light of a serious question, there is no denying the fact that in England the regulations are most radically stringent, and it is an act of trespass to walk upon the right of way of a steam railroad and the offense is promptly punished with arrest and heavy fine. Undoubtedly in many instances we are much too careless and would do well to exercise more caution. In this connection, however, it is extremely interesting to watch the progress which electric railways are making in Great Britain in overcoming the popular prejudice which raged so bitterly against trolley systems. We note that only a few weeks ago the new electric line between Kidderminster and Stourport, which crosses the Great Western Railway, was permitted to make the crossing at grade.

The opening address of President Insull at the meeting of the National Electric Light Association deals with topics which interest street railway men as well as electric light men. The question of standard as opposed to special machinery is an important one from the points of view of both the user and the maker, and is a question which if late has led to much discussion as to the relations which should exist between the manufacturer, the customer and the engineer.

On the question of compensation for franchises he takes the position that it is matter of indifference to the electric light company because such compensation is merely a tax which must be paid, eventually, by the consumer, however wrong in principle such methods of collecting the tax may be. The same point was made by the Railroad Commissioners of Massachusetts, i. e., that a franchise tax for street railways merely increases the cost of transportation which the passenger must pay. The case, however, is not a parallel one as between electric light service and street railway service; for while in the former instance prices can be raised, the street railway is tied hard and fast with a maximum rate of fare, and the infliction of say a percentage tax of 5 per cent could not in any particular be recovered from the patrons of the street railway, unless it was at the expense of a less efficient and comfortable service, and this is a retrogression which companies and public alike wish to avoid. It is obviously policy and wisdom for all concerned that the roads be allowed to collect such a fare as will enable them to steadily improve the service rendered, both in the quality of rolling stock and the frequency of service.

The operating street railways of the country are generally enjoying a good business, and the summer riding is now well under way. The effect of war has thus far not been unfavorable, while in some cities—those in which troops were or are mobilized and where government contracts are being filled—a marked increase in receipts has resulted. While the inability to place securities on the many projected roads has deprived the supply concerns of several million dollars' worth of promised orders, the regular business for renewals and improvements in existing roads has been good and steadily increasing. If the war could reach its termination by the first of July there would still be time for many of the contemplated new lines to build partly or wholly this season, although few interurbans like to make their start at the end of a summer after the bulk of the pleasure riding is over.

The rapidity with which many of these projected lines could move, would, however, be surprising, as in most cases the estimating and selection has already been made, and the promoters only wait the word that the money is forthcoming to close contracts for practically all needed supplies within 24 hours.

We believe that when the barrier is removed orders will pour in with the inevitable result that manufacturers will be snowed under and annoying delays will result in getting shipment on material.

Capitalists are already beginning to realize that the war will neither have any panicky effect on the country, nor will the opportunity to make big profits on quick turns in the money market occur, and they are each day becoming more convinced that it was a mistake to lock up money which might just as well have been drawing good interest during the past four or five months. Many operators, however, have already secured extensions of time, and will let their work go over to next spring, which will mean a whole year's loss of interest that would have been payable on bonds placed this season.

In these days scarcely a ripple is seen where a few months ago the daily press lashed the waters into foam, as the editorial forces blindly hurled themselves into a denunciation of the universal 5-cent fare. The public press is powerful and eventually victorious only when it works on premises which are right and just; and as the 3-cent and 4-cent fare was neither possible on the part of the companies, or demanded by the public, the agitation turned out a great fiasco.

In a few cities politician aldermen, thinking to make a grand-stand play, endeavored to force low fares. Milwaukee was one of these, but the company promptly defended its rights, and Judge Seaman, of the federal court, has rendered an important decision. The leaders of this agitation are either demagogues who seek personal popularity and place, or men of a single idea who are blind to all arguments which do not lead to the conclusions they wish to reach. Were this not the case it would be incomprehensible how cities could advocate such legislation in the face of the many demonstrations, that the street railways cannot possibly furnish the service they are now giving if their receipts were reduced 20 or 40 per cent.

In this case the court finds the testimony "uncontradicted and conclusive" that the service received to the public of Milwaukee is well worth the present fare; that the company has not received earnings in excess of an equitable allowance to the investors for the means necessarily invested in furnishing such service, and that the proposed reduction would deprive the complainants of property rights by preventing reasonable compensation for service. Confiscatory rates are repugnant to the constitution, and any rate incompatible with income sufficient to meet expenses and yield a fair return on investment is confiscatory.

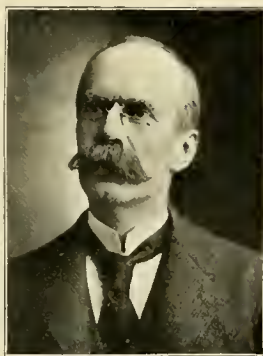
Calculating the value of the company's property, "based solely on the cost of reproduction," as shown by the expert testimony submitted, and making the most liberal estimates (adverse to the company) the profits amount to but 7.2 per cent on the "fair" value of the property. This is a very strong showing of the weakness of the 4-cent position, because the "cost of reproduction" is not an equitable basis for estimating the value of the property, inasmuch as it does not include the cost of experiments nor the capital necessarily lost when old apparatus is replaced by new.



**DEATH OF JULIUS S. GRINNELL.**

Julius S. Grinnell, who since 1891 has been general counsel for the Chicago City Railway, died suddenly of heart failure on June 8. Mr. Grinnell had gone to the Illinois Trust & Savings Bank for a business consultation and here his death occurred.

Julius S. Grinnell was born in Massena, St. Lawrence county, N. Y., in 1842. His father was Dr. A. H. Grinnell and his mother Alvira (Williamson) Grinnell, both natives of Vermont. Julius was prepared for college in Potsdam (N. Y.) Academy, and was graduated with honors from Middlebury (Vt.) College in 1866. He studied law with William C. Brown in Ogdensburg, N. Y., and was admitted to the bar in 1868. He practiced law two years, and then became principal of the Ogdensburg Academy.



HON. J. S. GRINNELL.

In 1870 he came to Chicago and resumed the practice of his profession. In 1879 he was elected city attorney, he being a democrat and the city administration republican. He was renominated in 1881 and elected by a large majority. Three years later he was nominated by the democrats for state's attorney, and was the only democrat elected in the county.

While state's attorney he prosecuted the "ballot box" cases, the "boodling" cases and the "anarchist" cases.

In 1887 he was elected judge of the superior court and served until 1891, when he resigned to become general counsel for the Chicago City Railway Company.

Mr. Grinnell left a widow and a son and daughter. He was a lawyer held in high esteem by the members of his profession; and was generous, warm-hearted and made friends wherever he went.

**RUSSELL SAGE ON THE NEW YORK RAPID TRANSIT.**

Russell Sage has given out the following statement of the situation: "The action of the Rapid Transit Commissioners in appointing Mayor Van Wyck and Comptroller Coler with Mr. Orr upon a compensation committee to agree upon the amount Manhattan should pay for the West Street franchise is an attempt to throw the responsibility of a reasonable rate upon the mayor and comptroller, and is unwarranted. The taxpayers of this city have been treated shamefully by the commission, which has spent \$450,000 of the people's money and has accomplished nothing. It has dilly-dallied its time away at unnecessary expense, and, instead of making the mayor and comptroller scapegoats for what the commission must know is to come, it should treat the matter in a businesslike manner. A 'hole in the ground' is not feasible, on account of lack of funds, and the only other remedy is for Manhattan to increase its facilities upon a reasonable basis. We are now the largest single taxpayer in New York, and are willing to make further large investments, but for transportation purposes only, and not to regenerate dead real-estate deals."

**ELECTROLYSIS IN A NEW PLACE.**

Several years ago when the electric railway was in its infancy the subject of electrolysis caused a good deal of anxiety, and the daily press devoted a great many columns under the scariest kind of scare heads to telling what enormous damage was to result from the return currents of the railways. The principal sufferers in those days were to be gas and water companies having pipes in streets where the tracks were laid, but recently a new "danger" has been exploited; this time it is building foundations, the steel work in which, it is alleged, is being rapidly destroyed.

The following letter explains itself:  
 EDITOR STREET RAILWAY REVIEW:

In the "Chicago Tribune" of Sunday, April 10, 1898, there appeared an article on the effect of electrolysis on the steel used in the foundations of buildings, in which it was stated that I had made investigations of the foundations of certain buildings in Chicago, and had found that the steel in them was injured and in danger of ultimate destruction by electrolysis.

I have never made any such investigations, and when interviewed by a young man representing himself to be a reporter I refused to express an opinion as to any effect that electrical currents might have on steel used in foundations. All that part of the "Tribune's" article that referred to me was fabrication pure and simple.

The day after its publication I asked the insertion of a card making the proper denial, which the "Tribune" published. One of its editors promised that an article should be prepared and published in the next Sunday's paper making the correction. This was not done, and it is probable that few of the readers of the "Tribune" have seen my card.

As earth saturated with water is a first-rate conductor of electricity, it is only barely possible that a subterranean current might pass through a piece of buried steel under such circumstances as to produce electrolysis, just as there is always a possibility during a thunder storm that a person may be struck with lightning. Further than this I do not believe that the steel in foundations is exposed to the slightest danger from any injurious effects of electricity.

I will feel greatly obliged to you if you will publish this statement, as undue prominence has been given to the false statement of my opinion, and it is doing a great deal of harm.

WM. SOOY SMITH.

**THE MAIL CAR IN PITTSBURG.**

Street car mail service was inaugurated in Pittsburg, Pa., June 1, and became popular with all citizens at once. An average of from 5,200 to 5,600 letters were collected on each trip. The first car to run on Uncle Sam's business was in charge of Assistant Postmaster George W. Wilson and Joseph F. Guffey, superintendent of city delivery.

The system worked without a hitch. The big boxes were unlocked and an empty bag substituted for a full one. The amount of mail handled was enormous, and every employe in the service was kept rushed with business. The Consolidated Traction Company has placed another car at the disposal of the government for the mail service.

The contract for the erection of a new power house 60x150 ft. was on May 11 let by the Omaha & Council Bluffs Railway & Bridge Company to Wickham Bros.

BIB. CO. - UT. COLLEGE FUND.

## FIRST ANNUAL MEETING, ILLINOIS STREET RAILWAY ASSOCIATION.

A Successful and Enthusiastic Gathering—Association Firmly Established—Discussion and Study of Power Plants Occupy a Large Part of the Time—Next Meeting September 20 of This Year.

The Illinois Street Railway Association, while the youngest of the state organizations, is by no means the least active and vigorous, and breaks the record by recording an organization, its first annual meeting, and the date set for a third, a special meeting, all in one year. To President Patterson, Secretary Minary and Superintendent Brennan of the Chicago General Railway is largely due the success achieved in getting the Association on its feet and starting it on a promising road of usefulness and long life.

The wisdom of choosing a date co-incident with that of the National Electric Light Association, also meeting in Chicago, was demonstrated in the frequent visits to the state meetings of delegates to the Light Association and the cordial expressions of good will which they brought.

The convention occupied two days, the meeting on June 7 being devoted to routine business, an executive session, and visits of inspection to some of the interesting power plants in the city. In the evening General Manager Hopkins of the Alley L. tendered the members a special train over his road to afford an opportunity to witness the operation of the new system of multiple control and to visit the company's new and extensive power station.

The morning session of the second day was called promptly to order in one of the banquet rooms of the Great Northern Hotel, and the reading of papers was taken up. The reports elicited much interest and discussion, and the several writers were given a vote of thanks. At this session President A. E. Lang of the Toledo Traction Company, and president also of the American Street Railway Association, was present, and while not expecting to speak, did when called on deliver an extremely interesting and suggestive address full of valuable experiences and useful suggestions. The figures he showed of the economical working of his large station plant, made possible by a wise arrangement of the latest machinery, was a positive surprise and shows what can be done in the way of cheap power production.

The supplymen of Chicago were largely in attendance and received a cordial welcome.

The following officers were elected for the ensuing year:

President—W. H. Patterson, Bloomington.

Vice President—D. B. Sherwood, Elgin.

Secretary and Treasurer—C. K. Minary, Springfield.

Executive Committee—W. H. Patterson, Bloomington; D. B. Sherwood, Elgin; C. K. Minary, Springfield; Walter Barker, Peoria; W. P. Cannon, Danville; D. F. Harris, Jr., Champaign, and D. A. Belden, Aurora.

A special meeting of the association is called to meet at Aurora, on September 20, 1898.

The badges with which the local roads decorated their visitors were extremely pretty, being in the form of a button with a car in gold on a black background and the date and initials of the association above and below.

Among the visitors were two ex-presidents of the Ohio State Association, Mr. Lang and Mr. Stewart.

Aside from the direct value of the sessions, papers and discussions, the opportunity for the various managers of the state, who have so many interests in common from an operating standpoint, to become better acquainted is of the greatest importance; and the delegates return to their roads

with new ideas as to improvements and with the solution of many a vexed question which some more fortunate manager has succeeded in solving. The membership is steadily growing and the Illinois Street Railway Association may be expected to be heard from in future and to make a strong place for itself among the several sister state organizations.

## Collection of Fares and Checking Employees.

BY W. L. FERGUSON, DECATUR.

The subject which has been assigned to me to write upon is tickets, transfers and checking conductors. This is a very extensive subject and one that is very important in the successful operation of a street car line. I do not expect to advance any new ideas as it is an old subject, and one that every manager is more or less familiar with, and he also has his own ideas and plans for this part of his work.

In regard to tickets, I believe that tickets sold at a small reduction will increase riding and that is what we, as street car men, want. If a man has some tickets in his pockets, he is pretty sure to use them, but if he has to pay out the cash every time, he is not so likely to ride, especially if he is going a short distance. Then again, they often have no small change at the time, and will not break a bill just for a ride. Another reason is, that if a mother has some tickets she will give them to her children to use, when she will not give them the money; and then they are so convenient. I have known patrons of the line to buy tickets, saying they like to use them as they then never need to bother with change, making it more convenient to them and the conductor as well. It also saves time and that is quite an item to many people. Then again, in selling 12 tickets for 50 cents, they make two rides, which is quite a saving to people who ride a great deal. You all know people will save a street car fare whenever they can. Merchants also often buy tickets to give to their customers, claiming it is a good advertisement. I think a school ticket sold at about two and a half cents, or \$2.50 per 100, will induce parents to allow their children to ride to and from school. I found it increased our business, but you must limit these books not selling to children over 15 or 16 years old, and make them not transferable, that only the persons to whom the book is issued can use the tickets.

The subject of transfers has given me a great deal of trouble as I am running a line which has seven different branches starting from one place, called the Transfer Station, and a great deal of our business is transfers. My first plan was to have one man issue all transfers. This man's duty was to be at the transfer station and give transfers to parties who wanted them as they came in on the different cars. I soon found this would not do, as when business was at all heavy people would come and ask for transfers that had not been on any cars, consequently we were carrying people and getting nothing for their ride. I then abandoned the transfer man and had the conductors issue them. This went along nicely for a while but I soon found we were getting a great many transfers and could see no real cause for it. I commenced to investigate; in a few days I found we had men who were working us for from 50 cents to one dollar per day; they did it in several ways. First, they would date the transfers to suit and give them to their families or friends, this would be done while they were being relieved for their meals or at home. Second, they would get together and exchange transfers. For instance, two conductors would meet at meal time, each punching say five or ten transfers at different hours through the day, then take the same number of cash fares from their receipts for the day and then turn in the transfers instead of the cash. We, of course, could not stand that kind of business. I then tried the plan I am now using, and find it very satisfactory. I now use a



transfer, having them printed so the conductor has only two punches to make and they can be made quickly. They are numbered consecutively in books of one hundred. I charge every conductor with a book in the morning when he starts out for the day, he returns what he has left on his last trip. He must issue them in rotation, the conductor who takes them up turns them in at the transfer station upon his arrival there, putting them in an envelope, marking his badge number and the time he took up the transfers on the back of the envelope. The clerk in the office takes the envelope, opens it, examines the transfers to see they are punched correctly and time not expired. The clerk then places them on file to the credit of the conductor who issued them, so when the day's business is over we have every transfer that has been issued during the day on file, charged to the man that issued them, and then in order to see they are not dated ahead, the clerk runs them over in rotation and examines the date. In order to prevent the exchange of transfers, I have the conductor collect fare and give transfer before collecting another fare, and no transfers are issued off the cars. This plan gives the men to understand you are watching them, and if a mistake is made we know it and who made it. After I adopted this plan it was surprising how our transfer business dropped off. This system is not expensive, it takes only one clerk. I have a lady clerk and in addition to looking after the transfers she makes change for the men, receives and counts the daily receipts and does other work about the office. In addition to this, I use the envelope the conductor turns in, as a trip sheet, having him put down the number of passengers carried each way. I have all transfers rung up the same as cash. If you don't ring transfers you cannot check your line.

Checking of conductors can be done in a great many ways. I think no person should ride without paying a fare of some kind. Never allow your officers or directors to ride without paying something for their ride. I would advocate a pass book and have a ticket taken out by the conductor and registered. You must have something for every ride if you want to check your line satisfactory and have every fare registered whether it be pass, ticket, transfer or cash. I know some lines do not register their transfers. You cannot watch men too close. It is a great temptation for men to take all they can get from a street car company, thinking they are working long hours and are not getting enough pay for their services, and again the public feel considerably the same way. I know of cases where passengers have said to the conductor, "Don't ring them all up, I will not give you away." I consider the stationary register the best, as every one can see if their fare is registered. The register should always be set back at zero at the end of the line.

#### Operation of Street Railways in Small Cities.

BY E. X. LESEURE, GENERAL MANAGER DANVILLE GAS, ELECTRIC LIGHT AND STREET RAILWAY COMPANY.

When our secretary first sent me the notice that I would be expected to prepare and read a paper before this association, on the "Operation of Street Railways in Small Cities." I immediately wrote him that I would be unable to attend the meeting, and suggested that it would be proper and fitting to invite some one else who would be better qualified for the task.

He very politely informed me that when a member of this association was invited to prepare a paper, the only excuse that would be accepted would be death. I believe you will agree that the alternative presented was too severe for me to spare you.

Let me say that the operation of a street railway in a small city, viewed from any standpoint, is beset with many petty annoyances and difficulties, and that consequently a paper on the subject cannot be expected to be entertaining, and also that different conditions existing in different small cities render theoretical operation from a general stand-point out of the question.

I will therefore confine myself largely to the operation of one street railway in one small city, namely the one with which I am connected, in Danville, Illinois. Perhaps it would be proper at this time to state that Danville is a city of about 18,000 inhab-

itants, rather compactly built up, and that we have about eight miles of track.

Coming therefore to the question before us we will take for granted that the conditions are as follows:

That the road has been laid out to take advantage of any local conditions that may exist.

That the roadbed is the best that labor can make it, and that the construction is of the best.

That the equipment is sufficient, and also the best that money can buy. I do not mean that money should be lavishly spent on handsome finishings, but that no money should be spared on the serviceable parts of the equipment.

In no place more than in a small city is the rule true, that the "best is the cheapest." We cannot afford to spend one cent unnecessarily on repairs. It is the matter of repairs and renewals that hurts the small roads. Most any of us can scrape together enough money to pay running expenses, and perhaps enough to pay interest on the investment. To reiterate, the only way I see for a street railway in a small city to be successfully operated, is to buy the best, and take care of it afterwards.

As to the question of power, it must again be the local conditions that govern the matter. I believe that when a street railway company does no lighting or power business that an arrangement should be made with the local lighting company for power. Such an arrangement should be made whereby a small saving would be made to the street railway company, and also allow a small profit to the lighting company.

In our own case, owning the lighting company as well as the street railway, we simply allow to the electric light department a fair price for power, and charge same to the operation of the street railway.

Now comes the question, how many cars shall be run and how shall they be operated. As to the number of cars my answer would be to run as many as possible where distances are short. We have one line on which we find a 20 minute service ample, the people who ride at all being so far from the center of the city that they are glad to wait rather than walk. We have another line running through a part of the city more thickly populated, on which we find a car every 10 minutes is none too frequent. We have tried on this line both 10 and 20-minute service, with the results showing that the more frequent service is the more profitable; people not being inclined to wait long for a car where distances are short as they are apt to be in a small city.

We have another line on which I think one car a week would be sufficient, but as we are compelled under our franchise to run a car every hour, I am unable to give you any data on the subject. Fortunately for us the line is a short one and inexpensive to operate. In a small city we must never lose sight of the fact that distances are such, that the people are not obliged to ride, and consequently we must give them every possible opportunity.

In regard to operating these cars, I would say that I am a firm believer in the system of passing up the nickel. First, on account of the expense of conductors; and in the second place, to maintain discipline, men must be kept busy, and with a conductor and a motorman, with now and then a passenger, it is a hard problem. A good motorman can get practically all the fares, and I think in most instances, if good service is maintained, that the people will not complain at the small inconvenience of putting their fares in the box. On big days, of course conductors will be necessary, but by a little care, good men may be found for these occasions, who are ambitious to blow a whistle and say "Fare."

In our own road we operate eleven cars, and in the operation of same employ seventeen men; the superintendent, 11 motormen, one car-barn man, two car men, a teamster, and a track man. The car-barn man is the first man down, and he sees that all the cars get out all right, cleans up the barn, and helps relieve. Any spare time he may have, he puts in working on repairs to cars, etc. The two car men go to work in the morning in time to relieve for noon, and during the afternoon work at repairs.

These three men therefore do all the relieving for meals.

After the supper relief, the two car men take the cars as they come in, put them over the pits, and go over them thoroughly, to see that they are in good shape. Any car that is not in per-

feet repair, is not allowed to go out the next morning, but another car substituted. We are particular in having this rule enforced, always with the view to keeping down repairs and renewals.

The motormen run last in, first out, work about twelve and one-half hours, and are paid by the day. Our teamster is at the same time our lineman, and does all the work on the line, although we arrange to have the car-barn man also a line-man, so that in case of emergency he can take this work. The track man goes over the track day after day cleaning the curves and crossings. We use a T rail and I am quite sure he saves his wages in the wear and tear on cars, besides the saving in power.

We go over the line every spring taking up low joints, and we endeavor to keep them in as good shape as possible. We try to do all our car repairing and armature winding with our own men; by that I mean that we do not keep any skilled workmen for this work.

We do all our own painting of cars, by borrowing a good car painter from the railroad shops, and he with two cheaper men, does our work. We go over our cars every spring, touching them up and giving them a coat of varnish, repainting them thoroughly when they first begin to show need of it.

In case of heavy snows we open the track with snow plows, and endeavor to get the best paying lines open as quickly as possible, leaving the others until the last, hoping that nature will come to our aid, and bring us a thaw.

The selection and discipline of men connected with a road in a small city is a very important matter, and in our case is left entirely to our superintendent, and upon his judgment depends largely the question of the successful operation of the street railway. His men must be selected, not so much for their ability to do one thing, but for their ability to do a variety of things. A man might be a careful motorman and able to run a car economically and safely, and at the same time be totally unfit for a motorman in a small city where no conductors are used.

Our motormen must be able to run their cars, make change, which is furnished them in packages in amounts from ten cents to one dollar, answer questions, look out for passengers getting on and off, see that he gets all his fares, keep order in the car, and make himself generally useful and agreeable. If he has any time at the end of the line he is expected to sweep out his car and get it clean for his return trip.

The motormen must be firm in enforcing rules and regulations and at the same time be polite enough not to give offense.

In a large city, where everything is bustle and hurry, people expect to have rules enforced; they realize that business could not otherwise be carried on. In a small city we are obliged to have the same rules and discipline, but people are inclined to take advantage of the fact, that at times, some of the rules seem unnecessary, and try to impose on the motormen. Our superintendent however maintains a severe discipline; quite as severe, I presume, as on many larger roads, and I think it is a great advantage to us in dealing with the public. The public soon learns to respect your rules, if it knows that you enforce the same with your employes as well as with the public.

The manager of a street railway in a small town comes in contact with his patrons every day, learns to know them, and considers them his customers, and has to treat them much in the same manner as a merchant in a small city treats his customers.

In regard to the matter of providing some sort of attractions at the end of the line, in the hope of increasing travel, I would say it is a matter which has been tried in several small cities with varying success. We have tried it wherever we could without going to any great expense, and have managed to increase our revenue a little, but generally speaking I doubt whether the plan is feasible. I remember on one occasion we gave a concert at one of our city parks, and in point of attendance it was a success. I think we must have had three thousand people, and my recollection is that we carried but three hundred people each way, or about one-tenth of the people in attendance.

I could go on indefinitely relating the trials and tribulations of the manager of a street railway in a small city, but I know

that each man has "troubles of his own" without being asked to listen to those of another.

In conclusion let me say that I believe from personal experience, that a street railway can be successfully operated in a small city, but only by giving the same careful attention to detail, as is applied on the larger roads.

### The Rights of Street Railway Companies Under the Constitution.

BY CHARLES L. BONNEY, VICE-PRESIDENT CHICAGO GENERAL RAILWAY.

Constitutions are adopted for the protection of the weak and the poor. The strong and the rich do not need constitutions. They have other forces for their protection; therefore constitutions are adopted to establish a political equality for all persons. Judicial tribunals are created in the constitutions, having power to decide upon the reasonableness of all acts of the executive and legislative departments; therefore we should look to the judicial department as the most potent of the three. If the constitutional rights of the poor and weak are violated by a legislature or a city council, an appeal for protection may be successfully made to the courts. Persons have certain rights which a legislative body can not take away, injure or delegate. Legislative bodies may be classed among the strong, because of the power to pass harassing and unreasonable legislation.

The street railway companies of Illinois outside of Cook county have an average of only ten miles of road and are therefore individually weak. Collectively these companies represent less than one-third of the street railway mileage of the state. The independent cross town companies of Chicago represent less than 15 per cent of the state mileage, so that the outside and cross town companies, if combined, represent less than half of the state mileage, leaving the three old Chicago companies in control of more than half the state mileage and with probably 10 times the financial resources and political influences. In Illinois, the three old Chicago companies may be classed among the strong and all other companies in the state among the weak. That is, three companies in the state are strong enough to look to themselves while all other companies must look to the constitution.

The street railway legislation which was vetoed by Gov. Altgeld, the Humphrey bills and the Allen law did not originate from any of the weak companies. Their necessities were not consulted, but it was proposed to appropriate a large percentage of the annual gross receipts of every company in Illinois. There are some companies in the state which have not earned a dividend for years. Such legislation, as to such companies, is unconstitutional, as held by the Supreme Court of the United States in the Nebraska Rate case.

In Chicago we have a mass of oppressive ordinances which are such a rank violation of constitutional rights that their appearance suggests their existence as clubs to frighten the weak and oppress the poor. Ministerial hirelings are vested with judicial discretion and are authorized to arbitrarily execute their own conclusion without trial by jury or any other constitutional formality. Our duty as law-abiding citizens requires us to break up this vile practice. It is short-sighted folly for the companies to endure such oppression when submission to the courts is all that is necessary. Stand firmly on the constitution, rely on the federal courts and defy all unreasonable legislation of the state or the municipality. The more oppressive the legislation the greater the chances of victory in the courts. Public officials who act under illegal laws should in all cases be sued individually for damages, and if possible should be placed under bonds to keep the peace. Such a process of educating public officials is certain in the end to prove beneficial to the companies as well as to the public at large and is promotive of law and order.

The constitution of the United States declares itself to be the supreme law of the land and it guarantees to every one of us, weak or strong, the equality of the laws, the security of contracts and due process of law. Every public official—federal,



state and municipal—has taken an oath to support this constitution. Under it and through the federal court a lowly individual may defy a governor and the legislature, or a mayor and city council, and this national court has never hesitated to set aside legislative acts or city ordinances where rights under this constitution were interfered with. This court has established that a corporation is a person within the meaning of the constitution. It may be noted that the strong corporations very seldom raise any constitutional questions. They have other means of securing protection and it therefore remains for the members of this association to flaunt constitutional defiance to legislatures and city councils.

Under the constitution there are certain things which can be unquestionably required of the companies at all times. Municipal ownership may be obtained by condemnation. The cities or the state can pass reasonable police regulations. That does not imply any serious injury to the property or to the right to continue in the occupation.

This power is so simple that it does not furnish the politicians with material for entertaining speeches. Its general scope has been so well defined that inventive minds of newspapers and civic federations turn rather to untried fields. Politicians and newspaper editors have boomed a new fad—"percentage of gross receipts in consideration of franchises." This implies an annual examination of books—a most uncertain and unreasonable contingency, even from the public standpoint, and a scheme of doubtful legality, unless the state constitution be first amended for that purpose. There are a number of methods under which that percentage plan, if enacted, may be avoided, but it is not wise to go into that at this time. The city of Chicago tried the mileage tax fad. It is now in the Supreme Court of Illinois, en route to Washington for final disposition.

All the courts of the country have sustained a geographical classification as legal—that is, the basis should be territorial and not individual. The courts have also sustained the power to collect a license by a general law, uniform on the class within the prescribed territory. If the newspapers and politicians had no other purpose to serve than to promote the collection of a reasonable amount from the companies, and were not too particular about fostering some untried manner of the collection, the plan of territorial license for each car can be recommended as both legal and simple. If, however, this new percentage fad is forced, let it be with notice that not one cent of tribute will be paid until the cities secure the approval of the Supreme Court of the United States as to the validity of the law.

A great political hubub is now being created over a proposed repeal of the Allen law. The candidate who did not vote for the bill should, of course, vilify the man who did. If he can, he should get elected any way, regardless of truth or merits. That is the depraved condition of our politics. Give these political falsifiers who mislead the people to understand that so long as the street railway business is a constitutional occupation we will continue at the old stand as long as the federal courts are open, even if the Allen law and every act in the statute book is repealed. The legislature and the council are as powerless to murder our occupation as they are to murder our children; both are sacred under the constitution, and are carefully nursed by the federal courts.

On January 17 last, the writer submitted the following bill to your executive committee: (The words *in italics* are from the constitution.)

A BILL FOR AN ACT CONCERNING RAILROADS.

Sec. 1. *Be it enacted by the People of the State of Illinois represented in General Assembly:*

WHEREAS, The General Assembly of 1870 passed a general "law requiring the consent of the local authorities having control of streets or highways," prior to the location and construction of railroads in such streets and highways, and the occupancy thereof, for railroad purposes. And in pursuance thereof such "local authorities" have heretofore and may hereafter "consent" to the location, "construction" and "occupancy" of certain streets and highways heretofore or hereafter "proposed to be occupied by such railroads." And in pursuance of such "consent" certain railroads have been and may be located and constructed in certain "streets and highways" and may now or hereafter "occupy" the same,

Therefore, in consideration of the continued operation of such railroads "under such reasonable regulations as may be prescribed by law," the location, "occupancy" and use of any, all and every such "street and highway" as may have been or may hereafter be given by the "local authorities having control of the street or highways" so used and occupied, is hereby fixed at a period of 99 years.

Sec. 2. Every railroad company heretofore constructed or that may hereafter be constructed in any such street or highway shall be subject to all general police regulations of "the Board of County Commissioners" or Board of Supervisors as the case may be.

Since that time the writer has had occasion to carefully examine the old horse and dummy act, as applied to certain Chicago ordinances but as the conclusions reached apply equally to nearly all the companies of the state, the same are here reproduced.

The city council, on July 30, 1883, passed an ordinance extending the time named for the operation of the railways operated by the Chicago City Railway Company, the North Chicago City Railroad Company and the Chicago West Division Railway Company for the period of 20 years.

An opinion is requested as to the power of the city over these railway lines at the expiration of the 20 year term, in case no further extension of time shall be consented to by the city. Also as to the effect on existing lines of railway in case of a repeal of the so-called Allen law.

1. These railway companies are the creatures of the state, not of the city, and the city is also the creature of the state. Both derive their powers from the same source, and both are limited in their powers. The companies may acquire vested rights as against the state, the city can not. If the state desires to take the franchise of a railway company it must do so by condemnation, in which the trial by jury is guaranteed, but if the state desires to repeal the charter of a city, there is no condemnation, no compensation and no trial by jury.

2. The Supreme Court of Illinois has so repeatedly held that the railway "franchise" comes from the state and that the consent of the city is "a mere license" that the proposition can no longer be questioned. (152 Ill. 185.)

3. Prior to the passage of this 1883 ordinance, the state had issued various franchises to these companies and their successors, for the construction and operation of certain railways, the term of the franchises varying from 50 to 99 years. The only prerequisite in the constitution to the construction and operation of the railway authorized in such franchise then being the "consent" of the local authorities, which consent was properly exercised in the passage of such ordinance in 1883, and prior ordinances.

4. At the time of the passage of this 1883 ordinance the power of the city in this respect was limited to its own character and to the provisions of the horse and dummy act of 1874. The subject of the former act, as expressed in its title, is the city and not the company, while the reverse is true as to the latter act.

5. An analysis of these legislative acts shows a very pronounced distinction between the "location and construction" of the tracks, and the "operation" of the vehicle used. The 20-year limitation is mentioned twice in the state laws, once in paragraph 24, section 63 of the city charter, and again in section 3 of the Horse and Dummy Act. In the former, such limitation relates exclusively to the "locating, constructing or laying a track," without one word relating to "operating" cars. In the latter, section 3 relates exclusively to the right to "locate or construct," all reference "to operating" cars being omitted. In both cases such limitation relates to the consenting powers of the city as to the physical and geographical considerations and not to the franchise power of the company to continue in the authorized occupation. Section 3 says "such consent" that is, consent of the location and the construction, is limited to 20 years. Again, "such consent" is granted on the petition of the company, not the voluntary act of the city. But the company need not petition. Its tracks are already "located," and are already "constructed." Again, "such consent" can not be granted except on 10 days' published notice of the time of presenting "such peti-

tion." If there is no petition there can be no notice, thus the conditions precedent do not exist and the council is without jurisdiction to act. Therefore the city has no power to enact new "terms and conditions." The city, however, can find comfort in paragraph 25, section 63, of its charter, for the legislature has there authorized the city to "change the location, grade and crossings of any railroad."

6. The state laws relating to the "operation" of cars are all distinct and independent of the sections relating to the "location and construction" of tracks. The state constitution declares that railways shall be "under such regulations as may be prescribed by law." "Regulations" has a well defined meaning. The petition of the company; the 10 days' notice and the acceptance of the law are not necessary to the validity of "regulations." Paragraph 42, section 63, City Charter, gives the city power to "license and regulate" all common carriers, which includes street cars. Again, section 4 of the Horse and Dummy Act, gives the city power "to make all necessary police regulations concerning the management and operation of such railroad."

7. No provision can be found in either City Charter or the Horse and Dummy act which directly or indirectly requires any renewal or extension of the city's "consent." No power is granted to the city to impose any new "terms and conditions;" it must confine itself to "regulations." The act does not pretend to prohibit the use of the street and the operation of cars after the lapse of 20 years. It does not impose any penalty on the railroad for continuing such use and operation. It does not give the city any remedy against the railroad for such continued use and operation. A railroad is permitted on the ground of public necessity, and so long as that necessity exists the city could not arbitrarily terminate such use of the street. It may regulate but not destroy.

The writer is therefore of opinion that the wording of the legislative acts mentioned, indicates that the relative position of the state, the city and the railway companies, as to the right to continue in business at and after the expiration of the 1893 ordinance, will be, for all practical purposes, the same as it exists today, subject then, as now, to the power of "regulation." In which case it necessarily follows that a repeal of the Allen law is immaterial as to the power of the companies to pursue the franchise rights already acquired from the state.

All public discussion of the street railway situation proceeds upon the theory of what the law should be and not of the law as it is, and that the companies are unfortunate orphans, anticipating early annihilation unless some charitable Civic Federation or generous public official (of course without political ambitions), should sustain the breath of life at the annual rate of 10 to 20 per cent of the gross receipts.

In order to facilitate the sale of long time bonds, legislation is unquestionably desirable, but Civic Federations, newspapers and politicians are mistaken in the expressed view that legislation is a legal necessity. The companies are in excellent position to patiently ask the municipalities "what are you going to do about it?"

Under present legislation new companies may be formed under the steam railroad act, and as such are authorized to lease any of the old lines built under the Horse and Dummy Act; and, as such, are also authorized to convey persons and property by "animals or by any mechanical power." Such companies can then connect with other companies by lease or operating contract, can extend across county or state boundaries, and can organize an interstate and United States mail business. It is certain that as such lines extend outside of the municipal limits they become outside of the municipal control. Such companies would then pass under the jurisdiction of the state and federal railroad commissioners. These advantages are now at the exclusive option of the companies and can not be interfered with by the municipalities. The provision of the Illinois constitution requiring the "consent" of the municipality, is expressly limited to a "street" railway, and not a railway in the street, therefore it may not possibly apply to general railroads. If a steam railway company may operate its road with "animals or any mechanical power," why should we not prefer to become general railroads operated by trolley, rather than "street" railways

operated by trolley? Whatever the judicial distinction may be, it may worry the cities, but not the companies. We will adopt our choice, and let the other fellow do the walking.

The attitude of the present city administration towards street railways is so entirely political and oppressive, and so devoid of all recognition of now existing rights, or of financial encouragement for the future, that the writer predicts, that within a year every street railway of Chicago will be federalized and the helpless insignificance of municipal arrogance completely demonstrated.

Among those in attendance were the following:

- C. F. Nagle, superintendent, Chicago City Railway.
- D. A. Belden, general manager, Aurora Street Railway.
- J. F. Porter, president, Alton Railway & Illuminating Company.
- J. A. Day, president, Belleville Electric Railway.
- W. H. Patterson, Bloomington Electric Railway.
- B. F. Harris, Jr., president, Urbana & Champaign Railway.
- E. X. LeSeur, general manager, Danville Street Railway.
- W. L. Ferguson, director, Decatur City Electric Railway.
- D. B. Sherwood, Elgin City Railway.
- W. B. McKinley, general manager, Joliet Railway Company.
- C. H. Cobb, general manager, Kankakee Electric Railway.
- W. Patterson, president, Lincoln Electric Railway.
- Walter Barker, president, Central Railway, Peoria.
- R. N. Baylies, president, Rockford City Railway.
- J. F. Lardener, general manager, Tri-City Railway, Davenport, Iowa.
- C. K. Minary, general manager, Springfield Consolidated Railway.
- F. O. Rustling, Bluff City Electric Railway, Waukegan.
- E. D. DuBois, Richmond, Ind.
- C. L. Bonney, vice-president, Chicago General Railway.
- H. M. Sloan, general manager, Calumet Electric Railway, Chicago.
- James R. Burrows, of the City Electric Railway, La Salle.
- A. E. Lang, president, Toledo (O.) Traction Company.
- F. E. Smith, auditor, Lynn & Boston Railroad.

## SALE AT LOCKPORT, N. Y.

The Lock City Electric Railway was sold at public auction in the lobby of the Niagara county court house June 8 at 11 a. m., under foreclosure proceedings brought by the Mercantile Trust Company, of New York. The mortgage under which the proceedings are instituted was given in September, 1893, and default on interest was made on March 1, 1895.

## END OF DETROIT CASE.

May 23 the United States Supreme Court rendered its decision in the case of the Detroit Citizens' Street Railway Company against the Detroit Electric Railway and the city of Detroit, and affirmed the decision of the state court. The case involved the right of the council to grant an exclusive franchise to lay street railway tracks in the city. In 1862 an ordinance was passed giving to the Detroit City Railway Company, of which the Detroit Citizens' Company is the successor, the right to lay railways in streets voted by the council to the exclusion of all other companies. In 1879 this right was extended for thirty years. In 1894 the council passed an ordinance giving the Detroit railway the right to lay tracks on the same streets already occupied by the lines of the other company. The old company then brought suit to restrain the new organization, on the ground that this ordinance impaired the validity of its contract with the city.



## THE EFFECT OF THE WAR.

So far but few of the operating street railways of the country have felt the effects of the war, either to their advantage or to their disadvantage. It is true that projected roads which

the war brings an era of prosperity. Aside from those in the manufacturing centers where there is an unwonted activity because of the heavy demands of the government for supplies, the roads feeling the effect of the war are those near the camps where the troops have been concentrated.



SCENES AT CAMP BUSHNELL AND IN COLUMBUS, O.

had reached the stage where their promoters were ready to put securities on the market are effectually tied up, and they will probably remain so until peace is declared. Among the roads in operation there are not many so situated that

Many of these camps were temporary only, particularly those at the state capitals, the men remaining there only long enough to be mustered into the United States service, and then leaving for the larger camps at the south.



A year ago the regular army of the United States comprised a total of only 27,532 officers and men, and the total authorized strength of the militia of the several states was but 116,000. In April the regular army was increased to



HEADQUARTERS, JACKSONVILLE, FLA.

60,000 men, and two calls for volunteers made, the first for 125,000 and the second for 75,000 men. The work of organizing this army is being carried forward as rapidly as possible, though it is necessarily somewhat slow. The men also must be held in camp until they can be properly equipped, and though the factories are working day and night on government orders the delays will be long in some instances. The public is again learning, what military men have always tried to teach, that no matter how capable a people may be, an army can not be organized and equipped in a day.

In the meantime some few fortunate roads are finding a

gratifying increase in their traffic, because when our friends set out upon a journey, especially when it is a dangerous one, we wish to assist them with their preparations and bid them farewell, and we all wish to see the trappings and pomp of war and listen to the inspiring strains of martial music. Also, a number of steam roads have made a point of running excursions from neighboring towns.

After the president's first call, 10,000 men were concentrated at Camp Bushnell, Columbus, O., all of whom were soon sent to Chickamauga and Washington when the regulars mobilized at those points were moved farther south. W. F. Kelly, manager of the Columbus Street Railway Company, has kindly sent us a number of photographs showing views of the camp and the crowds which the presence of the troops called out. The increase of the traffic on this road amounted to fully 20 per cent, the increase being probably equally divided among the three classes from which it might be expected to come, that is, the soldiers, visitors in the town, and the citizens. This company found the increase in traffic to be greatest in the afternoons and on Sundays. Thirty-five extra cars were found necessary. None of the employes of this company have expressed any desire to enlist, so that no "war orders" have been issued.

The illustrations show a number of scenes at Camp Bushnell and in Columbus.

Thirty-five hundred volunteers were encamped near Des Moines, Ia., and their presence caused a marked increase in the traffic of the Des Moines City Railway, the increase being from citizens as well as from strangers in town. The traffic was heaviest in the afternoons.

At Jacksonville, Fla., there is a large camp, and the riding of the soldiers has caused an increase in the receipts of the company of the Main Street Railroad of over 400 per cent;



SCENES IN THE CAMP AT JACKSONVILLE, FLA.

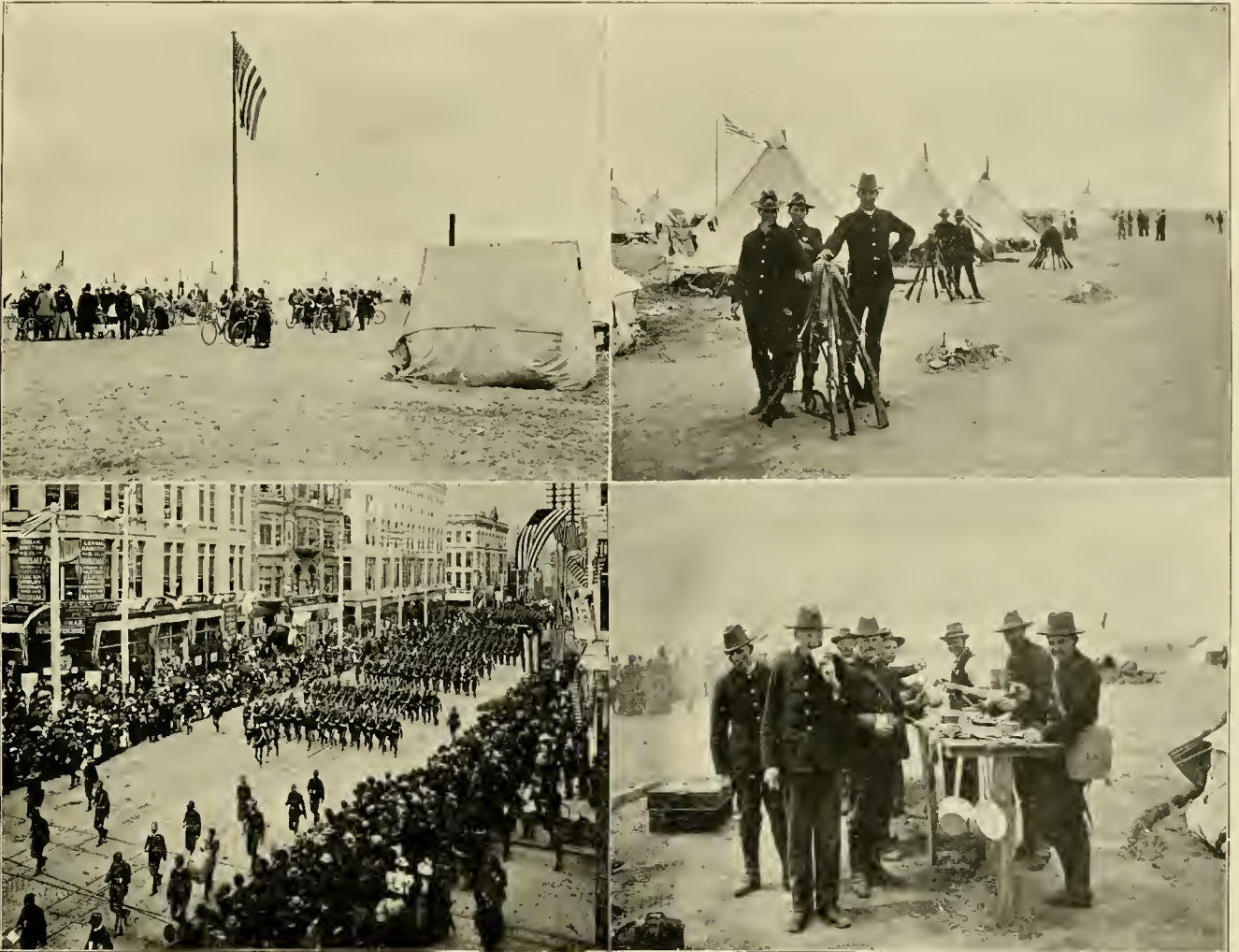


the camp is located on this road, and if the war continues for any length of time the company will be in the market for more cars. By the courtesy of S. B. Hubbard, president of the company, we have received the views of the Jacksonville camp which are reproduced here.

The Illinois volunteers were concentrated at Camp Tanner, Springfield, Ill.; there were 9,000 assembled at that point. While these men were in camp the local street railway had from 9 to 25 extra cars in service, the travel depending on the number of excursionists in town; Sundays

there since the relief expeditions were decided upon. The street railways have enjoyed some increase in traffic, but the city being a large one the percentage is not marked. The increase in traffic is greatest on Sundays and holidays, but extends over nearly all hours of the day when the weather is pleasant.

Thirteen hundred troops were in camp at Denver, Col., and the Denver Consolidated Tramway Company finds its receipts increased \$150 per day by reason of the extra traffic. This increase in receipts is due to the riding of citizens who



SCENES IN THE CAMP AND PARADE IN DENVER.

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were the big days. The traffic was steady throughout the day when there were strangers in town, and nearly all the increase was from this class. All the troops were ordered away on May 30, but the second call brought others to the camp.

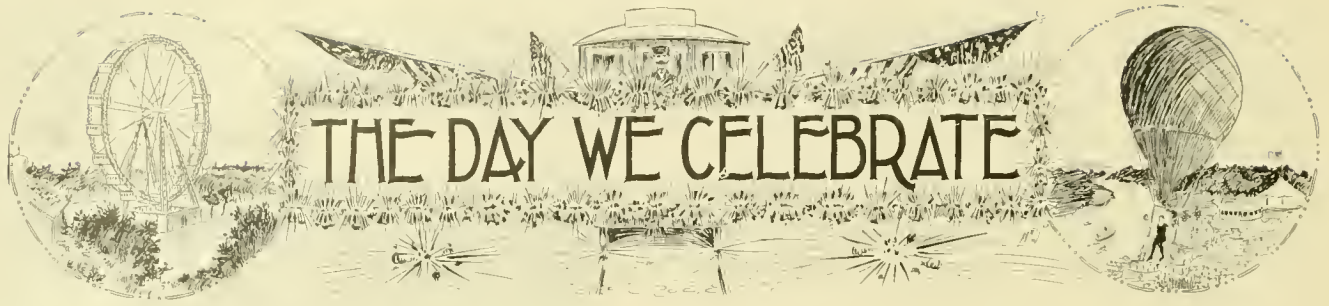
Since shortly after the declaration of war there have been between 8,000 and 10,000 troops stationed at Mobile, Ala., though several regiments have been withdrawn since the first of the month. The increase in the receipts of the Mobile Light & Railway Company was nearly 60 per cent, the heaviest riding being between 3 and 6 in the afternoons.

San Francisco being the point of embarkation for the Philippines, there have been about 10,000 troops stationed

visit the camp, as on April 25 Superintendent Durbin issued an order that members of the Colorado National Guard should be carried free when in uniform.

The accompanying illustrations show scenes in the camp at Denver and were reproduced from photographs taken by W. C. Daniels of that city.

Tampa, Fla., is the starting point for the invasion of Cuba and up to a week ago there were from 20,000 to 30,000 troops in camp at that point. By reason of this the traffic on the street railways owned by the Consumers' Electric Light & Railroad and the Tampa Suburban Railroad Companies has been doubled. The traffic here is heaviest between 6 and 7 p. m.



On July 4, 1898, this nation will be 122 years old and not in many years have events been so propitious for an old-time celebration of the day. The fact that the country is engaged in war, leads our thoughts to turn to past wars, the victories of our fleets fire the popular heart, and the orator of the day should find his task an easy one. But it may be that the "old time" celebration is not what people want; in fact the plans which have been made in many cities and towns indicate that such is the case.

We often hear regret expressed that in these latter days of the Republic, National holidays are not so fittingly observed as formerly, and the pessimist is prone to say that patriotism is waning. Events show, however, that our citizens are as willing as ever to respond to the country's call and we must look for another cause for the changes in the manner of observing the national anniversary.

The rapid growth and material development of the country have brought to pass many changes in habits, manners and thought. Being driven at a higher rate, and working under higher pressure now than formerly, the tendency is marked for men to seek amusement when a holiday brings enforced absence from business. Instead of listening to a speaker who can arouse the strongest emotions to which man is susceptible, and play upon them, the preference now is for rest or amusement. The reason is the same that has caused the vaudeville performance to become so popular an entertainment—the mental strain is less. About all that now remains of the old 4th of July is the noise that the small boy makes, and that remains because boys always have and always will delight in noise.

The Toledo Traction Company will have a balloon ascension in the afternoon and an exhibition of fireworks in the evening at its Lake Erie Park.

At Marinette, Wis., the street railway company contemplates devoting the day to a series of games of various kinds, including boat racing and aquatic sports, and will conclude the entertainment with a balloon ascension, and in the evening give an exhibition of fireworks.

The Norwich (Conn.) Street Railway Company will have bicycle races, concerts, vaudeville performances and dancing, and end the day with fireworks.

At Tampa, Fla., the Consumers' Company will have bicycle races, a ball game, etc., and in the afternoon a sham battle.

The Winchester Avenue Railroad Company, of West Haven, Conn., will have base ball, band concerts, vaudeville shows, electric fountain display and fireworks for special attractions, though this road scarcely need provide anything out of the ordinary in order to ensure a good traffic on the 4th as Savin Rock on the beach of the Long Island Sound

is the great attraction for New Haven and the street railway has all the passengers it can handle on holidays.

In former years the Aurora (Ill.) Street Railway Company has had ball games, balloon ascensions and races, and in the evening fireworks as 4th of July attractions, the entertainments being given at an enclosed driving park and a small admission fee charged. This year the Illinois State Bicycle Meet is to be held at Aurora on July 2, 3 and 4, and the street railway company will not offer any other inducements to stimulate traffic.

The Woronoco Street Railway will have cycle races in the afternoon, including exhibitions of fancy and trick riding, and in the evening fireworks and a band concert. As compared with the attractions provided in previous years, the events will not be so numerous, but will be the best of their kind. It has been the experience of this company that good advertising pays, and it will spend considerable money in giving its plans for the 4th publicity.

The Union Traction Company, of Philadelphia, will have fireworks and special musical features, and in all probability some civic assemblage will meet at Willow Grove Park, the company's pleasure resort, in which event other attractions may be added to those at present contemplated.

At Birmingham, Ala., J. B. McClary, manager of the Birmingham Railway & Electric Company, has provided a program which covers the entire afternoon and evening. It includes a band concert from 1 to 6 p. m., a balloon ascension at 6:30, a concert later, an exhibition of fireworks at 10 p. m. and a ball at the pavilion after the fireworks. There will be 100 cars in service that day. Excursion rates will be given on the interurban lines where the fare is 10 cents or more, but no reduction will be made on lines where the rate is 5 cents.

The Duluth (Minn.) Street Railway which has a pavilion at the head of its incline railway with the lower floor fitted up as a summer theater, will have a band concert and patriotic addresses by popular speakers in the morning, and in the afternoon and evening special bills at the pavilion theater, probably followed by a fireworks exhibition. The management may also arrange for some games in the vicinity of the pavilion but this has not been fully decided upon.

At Binghamton, N. Y., the Binghamton Railroad Company has two summer resorts, Ross Park and the Casino; at the former the Okabe troupe of Japanese, 11 in number, will be the principal attraction, and in addition there will be band concerts and fireworks in the evening; at the Casino there will be a special vaudeville bill, concerts, fireworks and dancing in the evening.

The Keokuk (Ia.) Electric Street Railway for special 4th of July attractions has a Western Association ball game in



the afternoon and in the evening Pain's fireworks spectacle, entitled "The Battle of Manila."

The Bellaire, Bridgeport & Martin's Ferry Street Railway, of Bridgeport, O., is quite fortunate in that it need provide nothing special for the 4th but is already sure of all the traffic that it can handle on that day because Buffalo Bill will be there.

At Harrisburg, Pa., there are three parks lying in different directions from the center of the city with different attractions at each so that the travel should be heavy on all lines of the street railway on that day. At Paxtang Park will be Kane's Opera Company; at West End Park, a firemen's picnic and dancing; at the City Reservoir Park, fireworks and band music.

The Brockton, Bridgewater & Taunton Street Railway Company, of Bridgewater, Mass., has arranged for a week's engagement of the Columbia Pantomime Company at Pilgrim's Park, Lake Nippenickit, the week commencing July 4.

The Camden & Suburban Railway Company, Camden, N. J., in addition to its regular attractions, comprising a pleasure cable railway, carousel, swings, steam launch, row boats and the usual row of midway features, will have fireworks, a sensational aerial novelty and Edison's latest kinetoscope with animated pictures.

The Home Electric Railway, of Baton Rouge, La., celebrates the day by decorating its cars. A program is usually arranged in which the school children take part, but when the legislature is in session the public 4th of July celebration is arranged by it. The legislature sits from the middle of May until the middle of July in alternate years, 1898 being one, however.

At Danville, Ill., the street railway company is not making any effort for the 4th of July; the local lodge of Elks is preparing for a public celebration.

At Albany, N. Y., the city arranges a celebration and the street railway has all it can do to carry the people who wish to ride without making it necessary to provide special attractions.

The Mahoning Valley Railway Company, of Youngstown, O., has a number of resorts along its lines which are conducted by other parties, and at all of these picnics or entertainments will be given so that the railway will have all the business that it can handle without being obliged to undertake the responsibility of the entertainments.

The Omaha Street Railway Company needs not to provide special attractions for the 4th, because there is in that city the Trans-Mississippi and International Exposition. This the people of Omaha say is the greatest show on earth; we would not for a moment presume to dispute this and the street railway may consider itself quite fortunate in having so large and so attractive a special feature in the city during this summer of war and hardship.

The Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Company will have a balloon ascension, boat racing, band concerts and fire works at its Lake Cayuga Park.

The Ithaca (N. Y.) Street Railway Company has provided the following program at its park for the 4th: Balloon ascension, parachute drop, live turkey drop—"catch the turkey and he is yours," war pictures, vaudeville performance, band concert, fireworks—Dewey at Manila, etc. And after enumerating these as the events which he knows he will

have, Manager Belcher adds, "and we hope, a dry day and plenty of fares."

General Manager Nicholl, of the Rochester (N. Y.) Railway Company, states that the company has nothing special except such entertainments as will be furnished by the proprietors of the resorts at Ontario Beach, Windsor Beach, Sea Breeze and Glen Haven. The city has not as yet done anything in the way of preparing for a celebration.

At Sedalia, Mo., the Electric Railway, Light & Power Company, has for special attractions boating, "chutes," new bathing pavilions, log cabin restaurant where fish dinners are served, band concerts and an open air theater.

At Michigan City, Ind., the Lake Cities Electric Railway looks to the ball game which will be at the ball park at the end of its line to provide passengers for it.

At Piqua, O., the Midway Park is run in connection with the Miami Valley Railway, and it has arranged for the 4th: base ball game, bicycle races, the best vaudeville talent obtainable for the theater, a naval sham battle on the artificial lake, besides the usual features of bowling alley, boating and merry-go-round. The charge is 15 cents for car fare for the round trip, admission to the grounds and seat in the theater. It has been the experience of Bert St. John, the manager, that the best of attractions, low prices and prompt street car service will bring the traffic without fail.

The Columbus, O., Street Railway has no definite plans for celebrating the 4th. After the first call for volunteers, Camp Bushnell with its 10,000 troops proved the great feature of the city, and after these were ordered south the second call brought out 5,000 more early in June; should these men remain in camp over the 4th of July there will doubtless be more visitors than ever on that day and an old fashioned patriotic celebration.

The Newburyport & Amesbury Horse Railway, of Newburyport, Mass., is to have a large bonfire and concerts by a military band for its special attractions.

At Charleston, S. C., the Charleston City Railway Company will have a vaudeville entertainment at its suburban park (Chicora) for its white patrons and at Tuxedo Park (the colored resort) a mammoth colored picnic; in addition there will be a ball game at the base ball park. The 4th is a great day for the colored brethren and they all turn out for parades, picnics, etc., and liberally patronize the street cars.

The Holyoke (Mass.) Street Railway Company will have a special entertainment at Mountain Park, the street railway park at the foot of Mt. Tom, in which fireworks will be a prominent feature. The great summer attraction for the patrons of this road is the Mt. Tom mountain railway which is sufficient in itself.

The Omaha & Council Bluffs Railway & Bridge Company will have no special attractions this year because of the Trans-Mississippi Exposition. General Manager Dimmock makes mention of one feature which his experience demonstrates is a good attraction, one of the best in fact, at all times, and that is good music. Such music, he states, never fails to draw a crowd, but if the concert is poor the public is the first to realize it and remain at home next time.

E. E. Winters, superintendent of the Macon (Ga.) Consolidated Street Railroad, writes that the only extra effort that will be put forth by that company will be to give a matinee at the park theater in addition to the regular performance in the evening. The same course was pursued

last year with very satisfactory results. Where a company has made theatrical entertainments so successful a feature at its park resorts as has this one for the past three years, it is evident that the public appreciate it, and it is a good idea to stick to a good thing. The expense of such an extra performance is comparatively small since the troupe is already on the ground. The Macon Company went to a great deal of expense this spring in enlarging its theater and improving the facilities for handling such attractions.

The Pennsylvania Traction Company, operating between Lancaster, Columbia, Lititz, Marietta, Millersville, and the smaller intermediate towns will have opera at Conestoga Park, a dance at Chickies Park, fireworks, a dance and a variety show at Rocky Springs Park, and races at McGrann's Park during the day and by electric light at night.

The Tri-City Railway Company, Davenport, Ia., contemplate a program which includes: brass band concerts all day and evening, free dancing both afternoon and evening, a day fireworks display, balloon ascension and parachute leap, big free aerial act, vaudeville performances afternoon and evening and an exhibition of fireworks at night.

At New Orleans, the New Orleans City & Lake Railroad, of which C. D. Wyman is general manager, will have special patriotic demonstrations at its "West End" resort, features of which will be a grand concert by the Bellstedt American Band, of Cincinnati, patriotic songs by eminent soloists assisted by a large chorus, and a vaudeville entertainment. There will also be a series of vitascope pictures, including portraits of the prominent generals of the Revolution and of the present war, views of the warships of the American navy, the battle of Manila, and scenes in Cuba, Porto Rico and Spain; and a grand display of fireworks with portraits of presidents of the United States, etc. In the parks of the city special concerts will be provided by the company, together with other entertainments.

The Austin (Tex.) Rapid Transit Company will have an extensive musical program and a ball in connection with the Austin Fire Department. During the day there will be a picnic at the company's park. This is known as Hyde Park and is a beautiful enclosure of six acres with a fine grove in the midst of which is a small lake; here the company has built a pavilion which will seat 1,500 people and which has one of the best dancing floors in the state. During the summer this company gives free entertainments at the theater allowing the troupes a percentage of the car receipts. This arrangement has been found to pay very well.

The Celoron Amusement Company, which has the same manager as the Jamestown (N. Y.) Street Railway, will have among other attractions for the 4th, a league base ball game, an exhibition of fireworks, a balloon ascension and high dives.

The Sacramento (Cal.) Electric, Gas & Railway Company will have bicycle races as the drawing card.

The Norway & Paris Street Railway Company, of South Paris, Me., will have ball games, a picnic dinner at the park, with vaudeville performances during the dinner hour and in the evening; after this there will be dancing and fireworks.

A. W. Lawton, manager of the Colorado Springs Rapid Transit Railway, writes as follows: "We are especially favored by nature, surrounding circumstances and conditions being such that they give us all we can do upon all public holidays. A live corporation owning a fine race course and grounds at the end of one of our lines as well as fine ball

park, which is conducted by the students of Colorado College, both draw good crowds of people at races, ball games and various other sports. At the end of our Cheyenne Cañon line, a company is successfully building up a summer resort, having built a fine casino and a good summer hotel at this point. It has a first-class band which plays in the afternoon and evening in the Casino, the program differing from day to day for concerts; some specialties have also been introduced and sacred music is played Sunday afternoon and evening. Nature has done the rest, there being here two of the most beautiful cañons in the Rocky mountains which attract large numbers of people during the summer season. At the end of our Manitou line is situated the famous Manitou Resort with its numerous soda, iron and sulphur springs, fine hotels, the Ute Pass mountain road running to Pike's Peak, and numerous other attractions which draw large crowds not only from our own city but also excursions from Denver, Pueblo and other places. At the end of our Cheyenne Cañon and Manitou lines there are dances and other entertainments given throughout the week to which we contribute to a certain extent. On the 4th of July it will be unnecessary for us to put forth extra exertions to secure traffic."

The Meriden (Conn.) Electric Railroad Company will have band concerts, a balloon ascension, and fireworks among its special attractions.

The Los Angeles (Cal.) Railway Company makes a point of joining the Citizens' Committee which takes charge of all the general celebrations in that city and this year its plans have not yet been decided upon.

At Portland, Ore., the city has undertaken to celebrate the day on a large scale, and the City & Suburban Railway Company has made a liberal subscription to the cause. Its success seems assured and the company expects all the business it can handle without making any extra efforts for that day.

At Salem, Ore., a celebration to be held at the Fair Grounds under other auspices is expected to be of considerable advantage to the street railways, and makes other attractions for them unnecessary.

At San Francisco nothing is done by the street railways in providing 4th of July attractions for the reason that the climate is much against such outside attractions at this season of the year and also from the fact that every one who can do so leaves the city on such days.

The Concord (N. H.) Street Railway will have vaudeville entertainments and dancing both afternoon and evening at its park, which is called Contoocook River Park. Commencing with June 20 there are entertainments every weekday afternoon and evening, and on Sundays concerts, until September 12. There are no liquors sold on the premises and the entertainments draw the best people in the city. Everything is free to patrons of the street railway.

Manager Ed. E. Coombs, of the Leavenworth (Kan.) Electric Railroad Company, writes as follows: "We have permanent attractions in the Soldiers' Home and Fort Leavenworth; the State Prison is also close by, while the Federal Prison is at Fort Leavenworth. We utilize these attractions by running excursions to Leavenworth, on all the railroads entering here, numbering seven in all. We can almost depend on 5000 strangers and with the program arranged at the Soldiers' Home and the fort, we not only catch the strangers but the citizens as well. We also have large pic-



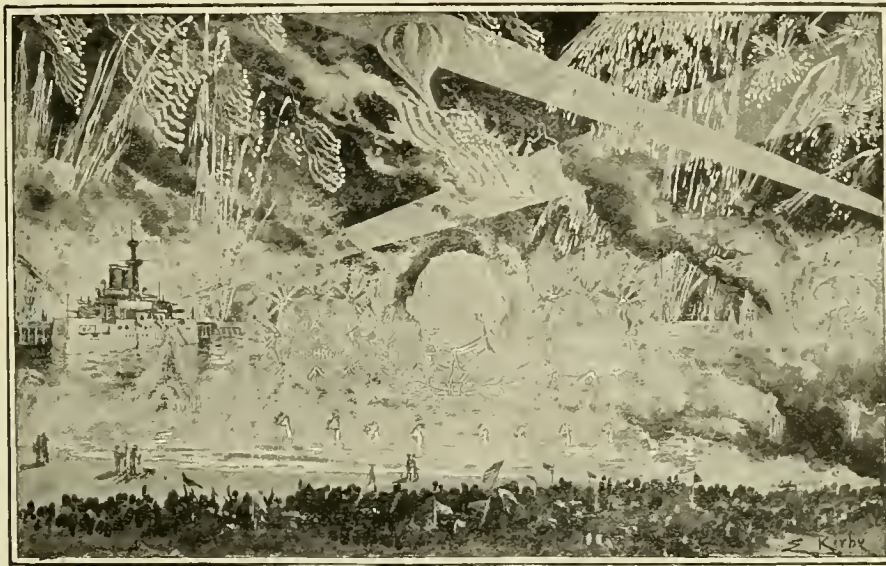
nic and dancing at the park, together with program consisting of races, ball game, athletic sports, etc., with a fireworks display at night and an electric fountain, which in itself is quite a drawing card."

The Houston (Tex.) Electric Street Railway will offer no attractions of its own as there will be a number of picnics under the auspices of local societies.

The Pottstown (Pa.) Passenger Railway has a superb summer resort, Sanatoga Park, and has spared no expense to make it the most delightful excursion and picnic resort in the Schuylkill valley. There are shady walks, rustic cottages, base ball and croquet grounds, lawn tennis courts, swings, see-saws, toboggan, merry-go-round. There is a lake 2800 ft. long and 400 ft. wide on which is a number of naphtha launches. Overlooking the lake is a large pavilion, with stage, large dancing floor, a smaller dancing floor for

New York, which has for many years made a specialty of the manufacture of fireworks has more recently undertaken to provide exhibitions especially adapted for street railway parks and pleasure resorts and has designed many varieties of such entertainments, ranging from a few candles and flower pots to very elaborate fire pictures, and each of them is an ample return for the cost. This company made a wide reputation by its exhibitions made at Manhattan Beach, "The Last Days of Pompeii," "The Siege of Sebastopol," "The Capture of Vera Cruz," "The Carnival of Venice," "Japan and China," "The Siege of Vicksburg" and a new spectacle called "Cuba" are among the productions specially well known.

If the pleasure resort is near a body of water a night of water fireworks always proves a success. These displays may be given with the fireworks alone or with the intro-



A FOURTH OF JULY DISPLAY.

private parties, broad balconies and promenades; an electric fountain is an additional attraction. On the 4th of July the Good Will Fire Company, of Pottstown, will have an outing, and a brass band and an orchestra have been engaged. At 2 p. m. there will be a water battle on the lake; in the evening a boat carnival and a display of fireworks are the principal features.

The Exeter (N. H.) Street Railway at Hampton Beach will have trotting races, bicycle races, band concerts, swimming matches and fireworks.

At La Fayette, Ind., there will be horse racing and bicycle racing at the Fair Grounds, which are at the extremity of one of street railway company's lines, and at its park, the company has arranged for music, swimming races, fireworks on the river and dancing.

As the reader of the foregoing has remarked, the great majority of managers appreciate the fact that for out-door entertainments and particularly for the 4th of July a first-class exhibition of fireworks is an attraction that can be relied upon. The Pain's Fireworks Company, of Chicago and

duction of a water pantomime which is highly amusing to the young people. And at the present time an evening of set pieces dealing with military and naval subjects is very appropriate. Almost any subject of the day can be given. Battles both on land and on water can be displayed with a wonderful degree of accuracy, and the ships of the American navy or portraits of leading men can be reproduced with absolute faithfulness as to detail. The American flag floating in the air is one of Pain's patents.

It is interesting to note in this connection that over a million people witnessed the water parade during the 1896 campaign in New York, and that the railway companies carried over 90 per cent of them; that over 100,000 persons went to Niagara to see the fireworks at the opening of the bridge there; that the Union Traction Company, of Philadelphia, had an enormous increase in its traffic during the exhibitions of fireworks at its Willow Grove Park, and that the street railways have been the beneficiaries at all of Pain's spectacles.

After considerable experimenting the Pain Company recommends for street railway parks an exhibition lasting

about 50 minutes. It should have its proper proportion of batteries of colored stars, spreaders, showers, floating stars, rockets of various kinds, bombs, packet fires, shells, etc., and set pieces. The latter are made according to the wishes of the purchaser, but a good display may be had for a reasonable cost.

### ANOTHER "COMPOSITE" CAR.

In the January REVIEW the "composite" car now in service on one of the branch lines of the New England Railroad Company was described, and in our March issue appeared a description of a car similar in design now running on the tracks of the C., H. & D. Traction Company. Considering the short time they have been in service these motor cars have attracted much attention and have grown in popularity. The Schenectady Locomotive Works have built another car, almost a duplicate of the New England car, for the Erie Railroad Company.

The illustration, from the "Railway Age," shows the ar-



COMPOSITE CAR FOR N. J. & N. Y. R. R.

angement, there being three compartments—for the engineer, baggage and passengers. The truck, engines and boiler are identical with those described in January. The water supplied is carried in the twin tanks underneath the car body, 1,400 gals. being the capacity. The fuel carried in the boiler magazine is anthracite coal. Westinghouse air brakes are used. The total weight of the car is 114,800 lbs., with 74,600 lbs. on the drivers.

The car is now operating between Jersey City and Haverstraw, N. Y., on the line known as the New Jersey & New York Railroad, which consists of 47.9 miles of road. There is seating capacity for 40 passengers. The operation of the car so far has given perfect satisfaction and seems to carry out the purpose of the designers. It is probable that this type of car will become popular for small feeder lines of the railroads, and it will doubtless come into favor where the steam lines have sharp competition with the trolley roads.

### STREET OR PARK?

Immediately after the Chicago City Railway had received permission from the city council to erect overhead wires for the temporary operation of electric cars over the down-town cable lines, a bill was filed praying that the company be enjoined from placing wires in Michigan avenue from Madison to Randolph streets, that being the east side of the Wabash cable loop. The contention of the complainant was that Michigan avenue was dedicated, with the rest of the

lake front property, for park purposes, and that the erection of poles and wires would be a violation of the purpose for which the street was dedicated. A temporary injunction was granted, and since the electric cars have been brought down town it has been necessary to depend on the cable cars to haul them these two blocks.

This injunction was dissolved on May 26, the appellate court holding that the complainant did not show whether Michigan avenue is legally a park or a street, a showing material to the case. The court added that it does not necessarily follow that land dedicated as public ground must be used as a park.

An amended bill was filed and the case is still pending.

### EARNINGS ON A SILVER BASIS.

The Mexican Central Railroad receives its income in silver and pays its fixed charges in gold; a large portion of its supplies are also purchased in the United States on a gold basis. The earnings (in Mexican currency) for the last six years show a steady increase, from \$4,146 per mile in 1892 to \$6,552 in 1897, an increase of 57 per cent. When this is reduced to a gold basis the figures are quite different and show a steady decrease from 1891 to 1894, since which time there has been an increase; but the earnings for 1897, in gold, were but \$3,129, as against \$3,236 in 1891.

### AN ILLINOIS INTERURBAN ROAD.

The St. Louis, Belleville & Suburban Railway Company commenced operations May 1 and the fact that its capacity has been severely taxed since that time is a guarantee of its success. The road extends from St. Louis 14 miles southeast to Belleville, Ill. The rails are 60 lbs. to the yard and of T section. The trolley wire is No. 000 figure 8 and the current carrying capacity is further increased by four No. 0000 feeders.

In the power station two 500-h. p. Russel engines are connected to two 300-k. w. Walker generators. The boilers have a steaming capacity of 1,200 h. p. The power house is a fire proof structure with steel frame work and tile roof.

The cars are 41 ft. long and each is equipped with two 50-h. p. Walker motors. They are double vestibuled and have cross seats which hold 48 passengers. The cars were built for speed and comfort and are from the works of the Jewett Car Company, of Jewett, O. Record runs have been made of a mile in 70 seconds and 14 miles in 28 minutes, including stops. The rate of fare is 10 cents. The steam roads have cut their rates but on account of the fast schedule the electric cars get the traffic. The road was promoted, financed and built and is now owned and operated by Townsend, Reed & Co., of Chicago. The officers are Fred F. Espenschied, president; George Townsend, secretary, and W. S. Reed, treasurer.

On June 5, Electric Park at the bluffs on the line of this road was opened, free concerts by Knuple's military band and vaudeville entertainments being the chief attractions. The park was brilliantly illuminated, and thousands of passengers were carried that day.

In Leipsig, Germany, but few signs are displayed in street cars and those are all placed on the ceiling.



### SQUIRE LAW TO BE CONTESTED.

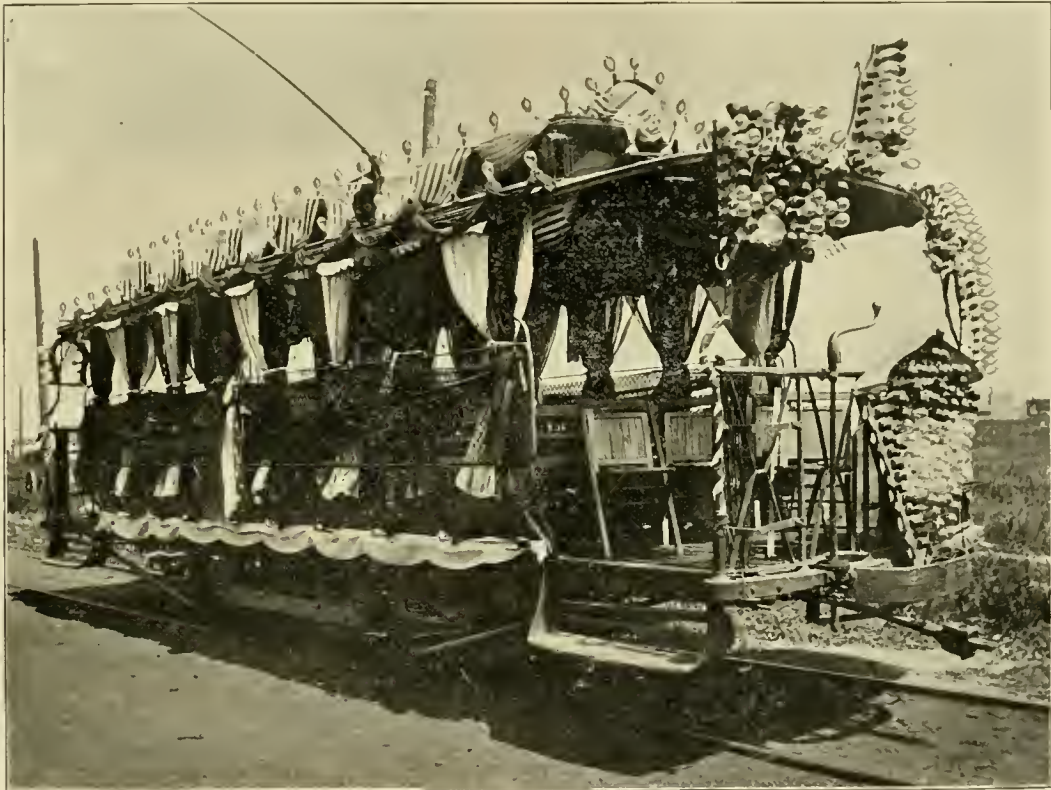
The New Jersey law approved March 31, variously known as the "Squire law," the "Bergen scheme," and the "trolley law," has aroused considerable opposition. As stated in the REVIEW for April, this law provides that the boards of chosen freeholders of the several counties may bond the county for the improvement of the highways and then, after proper advertisement, grant franchises over the roads to electric railways for terms not longer than 75 years. The company applying for a location must submit a proposition specifying what the construction will be, the rate of fare, the motive power, the contribution which it will make towards improving the road, etc.

### WIRING FOR DECORATIVE CAR LIGHTING.

BY W. A. HARDING, M. M. CALUMET ELECTRIC RAILWAY.

The Calumet Electric Street Railway, of Chicago, having to supply a very large demand for special cars and trains for trolley parties and picnics, the management has found it necessary to devise methods by which the lamps and bunting, used in decorating the cars, may be quickly put in place and as quickly removed.

In the STREET RAILWAY REVIEW, of August, 1897, there was published an article descriptive of the methods in use at that time; some minor changes shown by experience to be desirable have since been made, and the system of wiring reduced as nearly as possible to a standard, so that a



CALUMET MOTOR CAR DECORATED.

The most strenuous opposition is in Union county, where the board of freeholders is now trying to widen Westfield avenue, contrary to the wishes of the abutting owners. One of the local papers states that as passed by the legislature the act had a provision making it necessary to secure the consent of abutting owners before any action could be taken, and that when approved it was found that this section had been omitted by reason of the blunder of a clerk. For this reason the validity of the law may be contested in the courts.

The annual meeting of the stockholders of the Citizens' Street Railroad Company, of Indianapolis, was held on May 10, and the following gentlemen, all of Philadelphia, chosen directors: William Jay Turner, W. W. Kurtz, R. H. Rush-ton, J. Levering Jones, Joseph S. Neff, B. M. Gaskell and W. C. Houston.

more extended description of the present methods of wiring and connections, and of the arrangements for quickly fitting up and dismantling the cars will probably prove to be of interest to the managers of other roads having to cater to a similar demand.

The cars used by the Calumet are of a special design, having short cross seats with an aisle down the center, very large platforms with an open and unobstructed front dash, and screens permanently fastened on each side; this arrangement does away with the long running foot-board, leaving a short step at each end only. There are 15 of these cars which are in service on regular runs, but are called in when needed for trolley parties.

Each of these cars is wired as shown in Fig. 1, which is a plan of the roof. Down the center is run a No. 6 B. & S. wire, connected to the trolley base through a heavy fuse and

plug connection. At three points on this wire, at the center and near the ends at the hood, are fuse cut-outs; from these are run the several No. 14 B. & S. wires as shown in the diagram and terminating in the 12 contact brackets marked plus (+). Wires of the same size run from the 12 brackets marked minus (—) to the ground wires.

The brass brackets, Fig. 2, have a base 1x3x3/8 in. with a pin projecting, on which is cut a 3/8-in. thread for a thumb nut; they are fastened to the car in the positions shown in Fig. 1 by two screws.

For the tops of the cars the lamps are screwed into sockets, 10 of which are fastened to boards 3 in. wide and 3/4 in. thick. The lamps on each board are wired on two separate circuits as shown in Fig. 3, and staggered so that in the event of a lamp failing only one-half of them will be extinguished. The terminals in the boards are brass plates with holes in the center which make electrical contact when slipped over the brass pins of the brackets on the car.

For the side lights the distance between the positive and negative brackets is 6 ft., and for the end lights, 4 ft. The side strips are all of the same length, and the end strips also, the holes being laid out with a template, so that it is easily

car. On a few cars there are also rows of lights under the hoods.

The large emblems, shields, etc., are hung on the front of the car with brackets, Fig. 5, just as the ordinary oil headlight is hung. Each of the special pieces has plug connections which fit in terminals under the platform and connect to the car circuit. Occasionally, for special cars, a row of lights is placed along the main sill of the car. All of these extra lights are attached to the main trolley party wire on the top of the car. On the party trains two oil headlights are carried, one on each side of the front dash.

When the main cut-out and plug at the base of the trolley stand is opened all the wires, lamps, etc., are dead, leaving only the 10 lamps inside the car which can be used.

To dismantle these cars it is simply necessary to unscrew the thumb nuts and lift off the strips with the lamps and emblems. When removed from the cars the strips, etc., are hung on special racks at the rear of the barn, the lamps remaining in the sockets ready for use again when required.

In addition to the motor cars there are 30 trailers, which are similarly wired. These cars have a seating capacity for

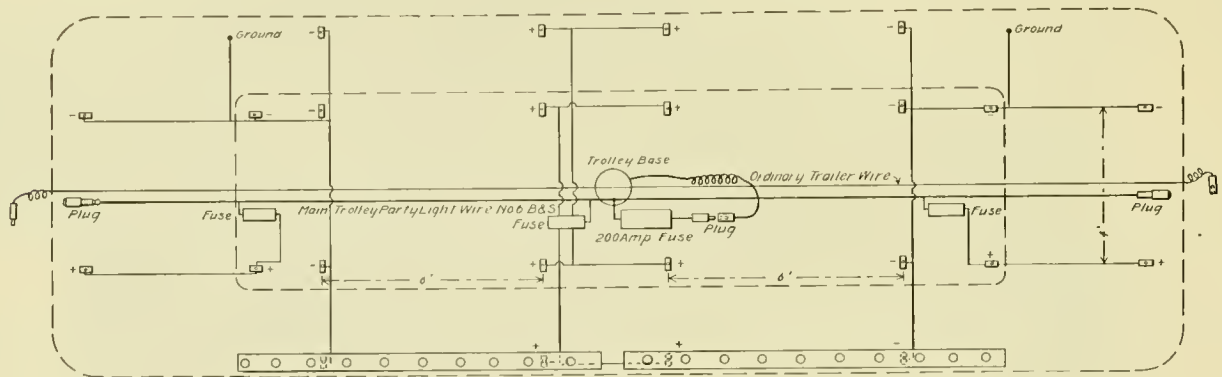


FIG. 1—PLAN OF CAR WIRING.

seen that a very short time is required to slip the strips over the bracket terminals, fasten them down with the thumb nuts, and then by closing plug at the trolley base light up the entire car.

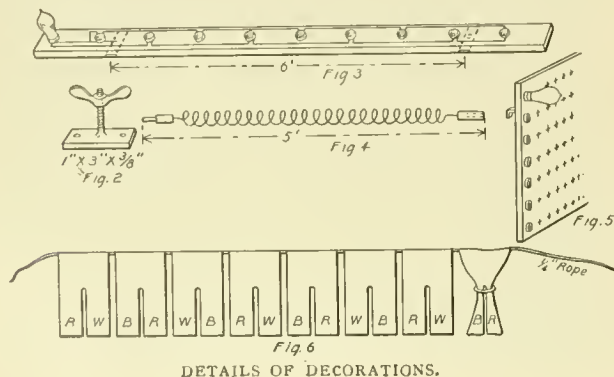
Inside the cars the center oil lamps have been removed and 10 lamps placed on each side. Five on each side are connected to a combination switch and cut-out inside the car, and these lights only are used at night when the car is in regular service. The other 10 lamps are connected to the main trolley party wiring and cut-outs on top of the

40 persons, and have running boards on the trailers.

A party train usually comprises one motor car and two trailers. For making the connections between the motor car and trailers there are plug connections of No. 6 B. & S. wire about 5 ft. long, which can safely carry from 50 to 100 amperes. These trailer connections are not left on the cars when not in use but are cared for by the conductors in charge. The ordinary trailer light circuit, of No. 14 B. & S. wire, is left intact.

Eight double curtains of the three national colors, made of woolen bunting, which will wash (this material has been found to be the cheapest in the end, though more costly to purchase) are threaded on a long 1/4-in. rope as shown in Fig. 6. To attach these to the car the rope is firmly tied to eyelets at each end of the car and slipped over hooks at each post. The divided curtains of two colors are then draped and tied at each post. For inside decorations the common cotton bunting is used. The floors of the large motor cars are covered with carpets, which are in three sections cut to fit around the seat legs, and can be laid very quickly.

A motor car and two trailers have been fully decorated with lights and bunting in ten minutes in order to fill a rush order; this included putting in place six sets of out-



DETAILS OF DECORATIONS.



side curtains and six sets of inside curtains, laying the carpet and fastening on 36 strips of 10 lights each, and a large emblem at the front and rear of the train, with headlights on either side.



PARTY TRAIN READY TO GO OUT.

A single trolley pole is quite sufficient to carry the extra current. The cars do not require as much extra current as might be thought; for instance, on one occasion when 55 cars, 20 motor cars and 35 trailers, were out, the highest reading at the power house, including the extra lamps (about 3,000), was only 800 or 1,000 amperes above the ordinary load, and when the cars got spread out over the system, sometimes fell to only 400 amperes extra. Thus the extra load varied from 20 to 50 amperes per train.

The largest party on the Calumet was that of the Cook County Cyclists' Association, held on September 19, 1896, when there were 20 trains of one motor car and two trailers each. The Knights of Pythias on one occasion ordered 125 cars, but the night being very cold they could use only 11 trains or 33 cars. The Royal League ordered 64 cars for its party but used only 55.

The company is making every preparation for a large business during the coming season, as the location of the road makes it especially suited for such parties. It is a beautiful sight to look up a long stretch of straight track and see these illuminated trains following each other closely as far as you can see, with the surrounding country lighted up as if it were day.

### NEW ROADS IN CONNECTICUT.

In the REVIEW for May, 1897, there were given some extracts from a then late decision of Connecticut Supreme Court as to the status of electric railways in the highways. The ruling of the court (three against two) was that an electric street railway is not an additional servitude on the abutting property. Another case is now before the court, and the New York, New Haven & Hartford Railroad opposes a franchise to the Fair Haven & Westville Trolley Company and pleads an additional servitude. Since the decision rendered last year one of the three judges constituting the majority has died, and another one has declined to sit in the case because he is a stockholder in the trolley company; a

substitute has been appointed and thus with two new judges who have not expressed opinions on this subject it is quite possible that the court may reverse itself.

Up until a year ago the New York, New Haven & Hartford road has successfully fought all trolley schemes in the legislature or in the courts, but realizing that this situation could not continue it undertook to develop the third rail as a rival. The official record from May 24, 1897, to November 1, shows that the daily average between New Britain and Hartford on the electric cars was 2,587 passengers per day, or \$258.70. Prior to the inauguration of the electric service the steam trains had carried 750 passengers per day, the income being \$135 per day. The fare was reduced from 18 cents to 10 cents on the electric cars. This period includes the first few weeks when the third rail was a novelty, but it is quite evident that the third rail system has resulted in a decided gain for the passenger service.

At the present time there are more than 50 miles of trolley roads, including extensions, either under construction or with the right of way purchased, and it is rumored that a third rail is to be laid on the steam line from New Haven to Derby, nine miles.

### CONEY ISLAND LINE OPENED.

The Brooklyn Heights Railroad Company on May 20, formally opened its new route to Coney Island over the Sea Beach Railroad. The details of this consolidation have been given in previous issues of the REVIEW.

At 10:30 o'clock the buffet parlor cars Columbia and Ampere, having on board President Clinton L. Rossister, General Passenger Agent H. W. Kennedy, Chief Engineer Brackenridge, several directors of the Brooklyn Heights Railroad Company, William Berri and various representatives of the press, left the Manhattan end of the Bridge and were run over the structure to the city hall, where a stop was made for some late comers. When all were finally aboard, the cars were run down Court street to Bush street, to Third avenue, to 65th street, where the cars were run down the incline to the Sea Beach tracks.

The actual running time from Manhattan to Coney Island was 51 minutes. Upon arrival there the terminal, with its double track loops and separate tracks to Sun avenue, was inspected, and then the guests were let loose on Coney Island. A stroll along the "Bowery" was leisurely taken, during which the most salient features of that thoroughfare were noticed. As some of the guests evinced a desire to try the steeple chase, the chutes and the other what-nots of the place, they afforded fun for the others, who looked on. After a walk along the beach the party adjourned to "India," where a theatrical exhibition was specially given. After this the gentlemen returned to the cars, where a substantial luncheon was served.

### PENNSYLVANIA STATE ASSOCIATION.

The date for the regular meeting of the Pennsylvania Street Railway Association is the first Wednesday in September, but inasmuch as the American Association meets September 6 to 9 inclusive, the date for the Pennsylvania meeting has been changed to October 19 and 20, in order to avoid a conflict of dates.

## THE RELATIONS BETWEEN THE PURCHASER, THE ENGINEER AND THE MANUFACTURER.

A Paper by William H. Bryan, read before the American Society of Mechanical Engineers.

When an engineering structure of magnitude is to be erected, what general plan of procedure should be followed, in order to insure that the finished work shall be best adapted for the intended purpose, and shall involve the minimum investment of capital consistent with proper construction, and the minimum cost of operation and maintenance?

In the erection of buildings, the precedent of placing the work in the hands of a skilled architect, has long since become well established. In civil engineering, the construction of railways, bridges, and roofs, is universally intrusted to engineers. In the newer branches of mechanical and electrical engineering, however, it has only recently become the practice in this country to engage consulting engineers. The principal reason for this has been that there have been heretofore but few specialists who have devoted their attention exclusively to this class of work. The few well-trained men in these fields early connected themselves with manufacturing or contracting companies, or entered into these branches of work on their own responsibility. The natural disinclination of the purchaser to ask for expert advice from an engineer—however competent and experienced—who is known to be interested in the manufacture or sale of some specialty, and whose opinion is not unnaturally open to the suspicion of bias, left him no course but to proceed on his own responsibility, with results which were often as unsatisfactory to the manufacturer as to himself.

This situation has, however, in a large degree changed, owing to the large number of excellent engineering schools, and the very thorough courses of theoretical and practical training which are there given. These, coupled with the large number of trained and experienced men who have been connected with prominent manufacturing and constructing companies, and with the installation and operation of large plants, have now rendered available the services of many men of thorough technical training, supplemented by years of practical experience in actual construction. Many of these have no connection with the manufacturing, selling and contracting interests, and their judgment is not, therefore, open to the suspicion of bias in favor of or against any special manufacturer.

It is becoming more and more the custom, therefore, to place the same confidence in the consulting mechanical and electrical engineer which has long been reposed in the architect and civil engineer. He is called in at the earliest stages of the development of the enterprise, for advice as to the general outline and arrangement of the scheme, its probable cost, the expense of operation and maintenance, and the returns which may be expected from the investment. He makes a preliminary reconnaissance and report, giving these data. If these are approved, he then makes a more detailed study of the problem, mapping out the general scheme more definitely, selecting the particular system or type of apparatus best suited to the local conditions of service, and preparing general plans and specifications. These he accompanies with more detailed estimates of cost. When these are approved by his principals, proposals are asked for, and when received, the engineer assists the purchaser in canvassing and comparing them, and in selecting that proposal—not necessarily the lowest—which seems best to meet the requirements of the work in hand.

The engineer then assists his clients in drawing up the final contracts, supervises the work during construction, and makes such final inspections and tests at completion as are necessary to determine whether the specifications have been complied with. This has long been the accepted custom in England, where the same difficulty of securing competent and unbiased engineers has not been encountered. No trouble has been met with in that country in applying the same rules to these branches of engineering which are universally followed in other fields.

As might be expected in any new department of engineering, however, the relations between the purchaser, the engineer, and contractor have not always been harmonious. The manufacturer

frequently feels that he has been imposed upon; the engineer is often hampered by incompetent or unscrupulous contractors, and between the two, the purchaser himself is sometimes at a loss for a proper solution of the difficulty. While it is true that most contracts of this character are carried through satisfactorily, it must be admitted that misunderstandings are more frequent than they should be.

The discussion of these differences has recently taken tangible form both in this country and England. In the latter country, the manufacturers and engineers recently met, and succeeded in agreeing upon a number of standard clauses for specifications, which removed many of the objections and criticisms from both points of view. It has been suggested that this work of preparing standard specifications would come properly within the province of the national engineering societies, but if these bodies do not take the matter up, something might be accomplished by the engineers and manufacturers getting together for mutual exchange of views, as was done in England.

The present misunderstandings may be traced to a few serious causes: In the first place, the mechanical and electrical fields of work have, unfortunately, been embarrassed by too great a number of incompetent and inexperienced manufacturers and contractors, poorly equipped for good work, and with but limited intelligence and skill. To these have been added a more than ordinarily large percentage of contractors, who are not altogether scrupulous as to their methods, and whose object is to finish the work in almost any sort of shape which will pass muster. These incompetent, inexperienced, and unscrupulous contractors—though relatively few in number—have detracted from the good reputation of work of this character, and have forced upon the consulting engineer the necessity of inserting in his specifications the most rigid requirements as to the character of workmanship and material, inspections and tests, which would be unnecessary, if it were certain that the work would be awarded to contractors of established reputation, ability and skill.

Furthermore, it has been found that some manufacturers are slow to adapt their designs and patterns to advanced and improved practice. Experience having shown the clear and decided superiority of certain designs, the engineer is justified in embodying them in his specifications, in spite of the fact that some manufacturers will attempt to force the continued use of antiquated forms.

Again, the manufacturers are often careless in making guarantees. Some of them do not hesitate to meet any desired figures, if a competitor does so. Often they will oblige themselves to do what is impossible with the type of machinery they offer, and trust to luck, or careless inspection or testing, to get the work accepted and paid for.

The grievances of the manufacturers have recently taken shape in papers and discussions in the electrical press, and may be briefly summarized as follows:

First.—That the engineer appears unwilling to receive suggestions or advice from the manufacturers, as such action might detract from the "dignity" of his position, and that specifications, therefore, often contain many annoying and expensive provisions, sometimes impossible of fulfillment.

Second.—That the engineer does not always familiarize himself with the facilities and standards of the manufacturer, and thus sometimes calls for special designs which can only be made, if at all, at greatly increased expense; whereas standard apparatus would frequently answer the purpose equally well.

Third.—That if the manufacturer is required to guarantee results, he should not be hampered as to details of design or construction. In other words, the consulting engineer should not tell the manufacturer how he should build his machine, but simply hold him responsible for results.

To these it may be answered, that no harm can be done by full and free consultations between the manufacturer and the engineer. They have a common object in view, namely, the securing of the best results. It is natural that the engineer should reserve unto himself a due degree of dignity, but he should not let this characteristic stand in the way of the best service in the interest of his clients.

The demand for special machinery, however, presents greater difficulties. It should be remembered that electrical developments have been so rapid in recent years—and with them the



construction of special steam engines and appliances—that a large percentage of the work has necessarily been special. Furthermore, this condition must continue, for the reason that the methods of generating and distributing electricity on a large scale, over wide areas, for endless varieties of purposes, have by no means reached uniformity of practice or system, and are not likely to very soon. The necessity for special machinery will, therefore, remain with us indefinitely, and will continue to cover a large percentage of our work. We must not lose sight of the fact that to attempt to carry the idea of standards too far, will surely result in hindering improvements and stifling progress.

I do not desire to be understood, of course, as decriing the use of standard apparatus for that large and increasing percentage of cases for which it is eminently well adapted. The manufacturers deserve great credit for reducing their machines for different classes of service to standards, and the engineering profession is under many obligations to them for doing so, in so thorough and excellent a manner. The reduced cost of standard apparatus—the fact that in using it, one follows precedent—that repairs can be more quickly and more cheaply obtained, and that when secured, the different parts are actually interchangeable, and will fit, and the further fact that standard machines can usually be secured in less time, being frequently carried in stock—all these are points of tangible advantage which no conscientious engineer can afford to overlook. Standard apparatus, however, is only possible when permanency of type and a reasonably constant demand in large quantities is assured. While it will frequently pay the engineer to modify his plans so as to use standard apparatus, there is a point beyond which he cannot go. In such cases he must use special apparatus more closely adapted to his particular needs. All these points must be given the most thorough consideration, and before requiring special work, the engineer must satisfy himself, beyond doubt, that his principal's needs can better be supplied in this manner, even at the increased cost, and in spite of the greater risks which always accompany the use of new and untried apparatus.

The contention that when a manufacturer guarantees results he should be allowed to design and build the machine in his own way, may be granted, in so far as the guarantee can be made to cover every possible valuable feature. When a reasonable number of manufacturers, however, have adopted certain designs and processes of unquestioned superiority, and where these have an important bearing on the life and reliability of the machine, its freedom from annoying interruptions and which reduce or avoid the necessity for close and continual attention, is it proper to write the specifications so as to limit competition to machines of this advanced type?

Contractors frequently object to specifications which include a deduction for delay in completing the work, but which allow no extra compensation for finishing the work earlier than the date specified. When it is possible for the purchaser to make use of the plant at the earlier date, this criticism is well founded. It is usually the case, however, that the earlier completion in no way benefits the owner, because other equally important contracts may not be finished, or because the date of leases or contracts for service from the plant cannot be brought forward. The delay of any one contractor, however, might readily cause the purchaser serious loss.

Another objection made by the manufacturer—and one which is not wholly without justification—is the unnecessarily exacting requirements of some specifications, and the annoyance to which they are subjected by the engineers. It is unfortunately true that our profession has been no more fortunate than others in keeping out of its ranks the incompetent and the unscrupulous. These men have brought disgrace upon the profession, and the objection of the manufacturers to being handicapped by them is well founded. There is, however, no reason now why the purchaser—even though absolutely unfamiliar with work in this field—should make a mistake in selecting an engineer, as a very little investigation will enable him to ascertain the character, ability, and experience of the man under consideration.

The engineer stands between the purchaser and the contractor, and while he may sometimes insist upon his client's rights to an

extent which may appear unjust, he nevertheless recognizes the purchaser's obligations as well, and will see that his end of the contract is equally well maintained. In this way unreasonable requirements may be avoided, prompt payments secured, and the acceptance and settlement made at the proper time and along reasonable lines.

Unfortunately there are some manufacturers who think the consulting engineer unnecessary, and that the business could be better transacted directly between the manufacturer and purchaser. This would be true if the purchaser were always competent to judge of the relative merits of the different systems of apparatus. Unfortunately the agent of the manufacturer cannot always be trusted implicitly as to recommendations, for two reasons: First, he has not the time to give to the detailed study of the problem which the consulting engineer must give in order to make a proper selection; second, his recommendations are too often biased by a desire to sell standard apparatus, or some specialty of his own, which could be used for the work, although less advantageously than something else.

It is here that the engineer serves his client best, in seeing that the proper apparatus is selected, and that it is bought at reasonable figures. The days when the salesman with the glibest tongue did the most business, are fortunately passing away, and the small manufacturer has as good a show to do business with the engineer as one of longer standing, providing his apparatus is clearly the best for the work.

The engineer compares machines on as nearly the same basis as possible. So far as the character of the machine will permit, he requires all proposals to be on the same apparatus. When this is impracticable he specifies capacities, results, and general type or construction, leaving the manufacturers to vary the details in accordance with their own designs and practice. Such proposals, however, should be accompanied by ample data, so that the points of agreement and difference may be clearly brought out. With these data before him the engineer is prepared to analyze the bids, and to make a recommendation based upon merit alone, irrespective of the name-plate which may be attached to the machine.

It is not meant by this that no weight whatever is to be given to long experience and established reputation, as there are many details which cannot be inquired into, and must be left to the manufacturers' judgment. No conscientious engineer, however, will let the mere reputation of a manufacturer carry undue weight.

Early in my own practice I learned, that while elaborate and detailed specifications embodying all sorts of unusual and peculiar requirements, might impress the non-technical reader, and might even gratify the purchaser, they invariably limited competition, and led to excessive prices and annoying delays, and that by purchasing machines as nearly standard as possible, and by modifying the contract to a reasonable extent, to suit the manufacturer in unimportant details, much better terms could be made, without increased trouble to either the purchaser or the engineer.

The contract forms submitted by many manufacturing companies are unfair to the purchaser, in that they are wholly one-sided, and are intended to protect the seller in every way possible, while the rights of the purchaser are given but little consideration. Such contract forms are far too common, and for the credit of the profession, it is hoped that these may be modified, and brought to a more equitable basis.

The ordinary proposals submitted by many companies are equally unfair. Perhaps the most flagrant instance of this is the statement in many bids that they are not effective until approved by an executive officer. Such proposals are not worth the paper they are written on, and should not be considered for a moment by any self-respecting engineer, as they in no way bind the bidders, and their acceptance simply ties up the purchaser. Instances are not lacking where manufacturers have taken advantage of this clause to repudiate bids apparently made in good faith. So common is this practice that it has become necessary to incorporate a clause in the "Notice to Bidders," to the effect that proposals which are not made in good faith will not be considered.

Another unfortunate practice is that which many manufacturers have of asking the return of their proposals and accom-

panying data as soon as the award is made. These papers are necessary to the purchaser and the engineer, to make a complete record of the transaction, and should be retained by them.

On the other hand, it must be admitted that some engineers' specifications are unfair to the manufacturer. The points on which these complaints are based have been given due consideration, and in my own practice have led to the following rules:

First.—When it is desired to permit the bidder some elasticity, and not to require him to adhere rigidly to the specifications, the "Notice to Bidders" contains a clause reserving the right to waive informalities.

Second.—The engineer is made the arbitrator of all disputes, but appeal is always permitted to a referee or referees. If the contractor thinks he is being treated unfairly he may avail himself of this privilege.

Third.—A clause is frequently inserted to the effect that where a special make or type of apparatus is mentioned in the specifications, it is not intended to mean the exclusion of all others, but simply as establishing a standard of excellence. The bidder may substitute other apparatus in his proposal, the engineer reserving the right to judge as to whether the article offered is equivalent to that specified.

Fourth.—Where the work is such that it is impossible to go into details very fully, and where the apparatus is of such a character that different builders offer different types of construction, which accomplish substantially the same results; or where it is desired to secure the benefit of the most recent improvements, a general clause like the following is sometimes inserted:

"While it is believed that the following specifications properly cover the needs of the purchaser at this time, they are not necessarily final. Bidders are invited to submit alternative propositions embodying any other types of apparatus, or other details of construction, which in their judgment may seem as well, or better, adapted to the purchaser's needs."

It is to be hoped that this presentation of the matter may result in a better understanding among all parties interested, as to mutual obligations and responsibilities. I believe I may say for the engineers that they will meet the manufacturers fully half way in an effort to reach a more satisfactory basis of cooperation, and to bring about a higher standard of design, workmanship, and efficiency, and a more uniform and equitable definition of contract relations.

### CO-OPERATION OF STREET RAILWAYS IN CHARITIES.

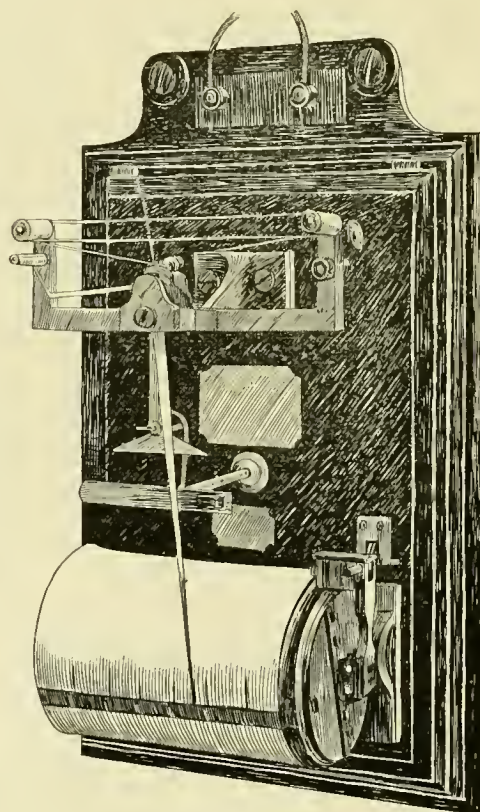
The REVIEW has frequently had occasion to note instances where a street railway has turned its road over to a social or charitable society for a day, donating the larger portion or all of the receipts as its contribution to the cause. Such action as this has usually had the effect of making the relations of the company and the public more cordial, and has proved a financial success as viewed from the standpoint of the society.

Several applications have been made to the Oshkosh (Wis.) Street Railroad Company for it to co-operate with church societies, and have a trolley day. Mr. Downs, the local manager of the company, has had considerable experience with such features, and in a recent interview gave the following data as to the arrangement usually made by the company. He said: The custom has been for the society that is to operate the road on a certain day to draw up an agreement with the railway company, wherein it is provided that a certain per cent of the gross receipts of the day, 30, 40 or 50 per cent, as the case may be, shall go to the electric company, the balance going to the society. Of course the ladies do not operate the machinery at the power house nor do they serve as motormen, but they serve in the capacity of conductors and handle all the cash. A dozen or two of

the prettiest young women of the city usually act as conductors and from 6 o'clock in the morning until 11 o'clock at night, all passengers will enjoy the presence of the fair ones. It will be giving away one of the secrets of the ladies, but the men should be warned that the lady conductors are not expected to know how to make change and the quarters, halves and dollars that fall into their hands will be quite apt to stay there.

### A RECORDING VOLTMETER.

Recording electrical instruments are in common use but in the ammeters and voltmeters it is necessary to renew the chart each day, for which a record is kept. The figure shows a voltmeter which will keep a continuous record for seven days on one chart. The instrument is the design of John



RECORDING VOLTMETER.

H. Barker, of Cambridge, England, and has been in service for some time. The chart is suitably plotted for time and volts and placed around a drum which rotates at a predetermined rate. By an arrangement of cams the drum is shifted each day and a record is made parallel to the preceding. A pencil is held at the end of a lever arm which is part of the link work operated from an electro-magnet.

The attorneys who brought the foreclosure suit against the Ft. Wayne (Ind.) Consolidated Electric Railway have asked the court to allow them fees amounting to \$62,500. This allowance was contested and a number of witnesses examined in an endeavor to show what would be a reasonable fee.



## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

**Using Brake Instead of Electrical Apparatus to Stop Car.***Stabeneau v. Atlantic Avenue Railroad Company of Brooklyn (N. Y.), 50 N. E. Rep. 277. April 19, 1898.*

Where a little girl, seven years of age, tried to cross a track, with some companions, on a crossing, when a trolley car was less than 100 ft. away, and approaching at the rate of speed usual in rural districts, and she caught her foot or tripped, and fell, and as soon as she was seen to fall the power was shut off and the brake applied upon the car, the court of appeals of New York holds that no negligence could be predicated upon the use by the motorman of the brake, instead of the particular appliance used to govern the electrical motive power. In the emergency, one of two courses was open to him, and the court considers it impossible to say that the one adopted was not as effectual as the other, under the circumstances, particularly as it appeared by the evidence that a sudden reversal of the electric power sometimes operates, as a witness said, "to blow out the fuse," in which case the power to control is lost. Whether the one or the other means provided for stopping the car should have been adopted was a matter for the exercise of the motorman's judgment, and, though newly employed, the motorman who chose the brake was not shown to be incompetent, and the court maintains that if he erred in the exercise of his judgment, the company could not be held responsible; neither would a failure to have exercised the best judgment have been evidence of negligence.

**Unauthorized Connection with Elevated Road a Legal Nuisance.***Eldert v. Long Island Electric Railway Company (N. Y.), 51 N. Y. Supp., 186. April 19, 1898.*

The second appellate division of the supreme court of New York has affirmed a judgment enjoining a street-surface railway company from erecting, constructing or maintaining, and directing it, within 30 days, to remove, from the center of an avenue 60 ft. wide, a connection made with an elevated road, consisting of a solid embankment or wall of masonry, about 8 ft. in width and 200 ft. long, rising by a gradual slope to a maximum height of 10 ft. above grade, from which point there was an iron structure, supported by iron girders, that connected with the elevated road.

This structure was erected with the consent of the highway commissioners of the town. But the court says that it finds no power resident in the highway commissioners to permit the erection of such a structure, their power, in respect to a street-surface railway company, being limited to granting it permission to extend its surface road or some branch thereof, still on the surface.

It is also of the opinion that a connection between a street-surface railway and an elevated railroad, by an inclined plane, is not a joining or union, in the sense of section 4 of the railroad law, giving every railroad corporation power to "join or unite" its railroad with any railroad before constructed. It therefore holds that the structure in question was unlawfully built, and was a purpresture and a nuisance.

Finally, the court insists that the consent of the property owners being but to a surface road, was no consent to an

elevation above the grade of the highway, and that a consent to the latter must be obtained from the abutting owners, though property owners abutting the road just before the structure was reached might maintain such an action as this, if specially injured by such a structure, illegally built.

**Not Resorts for Business Negotiations or Social Converse.***Atwood v. Bangor, Orono & Old Town Railway Company (Me.), 40 Atl. Rep., 67. March 1, 1898.*

Highways are constructed and maintained for the accommodation of travelers, and not as places of resort for business negotiations or social converse. And, since highways have been subjected to a new mode of use by the introduction of street railways, a still higher degree of attention, vigilance, and prudence is requisite to fill the measure of ordinary care demanded of the traveler. Travelers with teams and proprietors of street cars still have concurrent rights and mutual obligations; but as the cars must run on a fixed track, and rapidly acquire a greater momentum, they must to a reasonable extent be allowed the right of way.

These remarks are made by the supreme judicial court of Maine immediately following the declaration that it was impossible to resist the conclusion that a man was not in the exercise of reasonable and ordinary care and caution who stopped with his team about 6 in. from a street railway track to talk a few minutes with an acquaintance he met coming from the opposite direction.

But the court overruled a motion to set aside a verdict against the street railway company for damages resulting from a collision on the old ground that the motorman might with ordinary care have prevented the collision, and that a person may recover damages for an injury caused by the negligence of a street railway company, although the person's own negligence first exposed him to the risk of injury, if such injury was proximately caused by the company's negligent act, committed after it had become aware of his danger. In other words, if one discovers another to be negligent, he must take precautions accordingly, omitting which he is liable to the other for the damages which flow from such new want of care.

**No Injunction for Stockholder to Help Rival Corporation.***Jenkins v. Auburn City Railway Company (N. Y.), 50 N. Y. Supp., 852. March 26, 1898.*

Two days after taking an assignment of two shares of stock, of the par value of \$25 each, in the Auburn City Railway Company, the new stockholder verified a complaint that was filed praying for an injunction restraining the company from executing a lease of its entire property to the Auburn & Western Railway Company during the term of its corporate existence, in furtherance of a plan to parallel the New York Central & Hudson River Railroad with a street surface railroad from the city of Auburn to the city of Geneva, a distance of some 20 miles. The injunction was issued. But the fourth appellate division of the supreme court of New York, by a divided bench of three to two, now reverses an order denying a motion to vacate the injunction, holding that it should be vacated on account of the well-settled rule

that an injunction will not be granted or sustained against a private corporation in a suit brought by an individual in the interest of a rival corporation. It is pointed out, in the majority opinion, that the stockholder in question nowhere denied the charge that he purchased the certificate, at the instance of the attorneys of the New York Central & Hudson River Railroad Company, for the purpose, solely, of preventing any proceedings that the Auburn City Railway Company and the Geneva, etc., Traction Company might take for their own advantage and benefit. Under this state of the proof, it deems it evident that the action was not brought in good faith by the stockholder, for the protection of his own rights, but was brought by him at the instance of the railroad company, the line of which is parallel with the proposed line of the Auburn City Railway Company, and must be treated accordingly; while the two dissenting members of the court declare that the motive which induced him to purchase his stock and to bring his action in nowise affected his right to an injunction to prevent the corporation from leasing its property and franchises to another company, which they contend had no legal existence because the railroad commissioners refused it permission to construct its proposed line.

#### Care Required at Temporary Curves.

*Dillon v. Forty-second Street, Manhattanville & St. Nicholas Avenue Railroad Company (N. Y.), 51 N. Y. Supp. 145. April 22, 1898.*

Damages were claimed in this case for injuries alleged to have been sustained by a man who was standing smoking upon the front platform of a street car being thrown into the street by the car striking with violence a temporary turnout, which was afterwards shown to have been necessitated by the construction of a sewer under the regular track.

The trial judge told the jury that the allegation of negligence upon which the alleged cause of action was based was the rapidity with which the car went around this temporary curve, and he left it to the jury to say whether the injured man had met the burden of proof that rested upon him to establish that the driver of the car drove unskillfully and too rapidly at the curve, and whether it was by means of that alleged careless and reckless driving that he was thrown from the platform and was injured. That, the first appellate division of the supreme court of New York holds, was a proper submission to the jury.

But it does not stop there. The man swore that he was ignorant of the existence of the unusual condition of the track referred to. The driver must have been aware of it. Standing upon the front platform, as the passenger was, he was exposed to a danger of being thrown off by the sudden striking of a rapidly moving car against the curved line of the track. That was a situation, the court holds, which required the driver to exercise care for the safety of the passenger.

The absence of contributory negligence, it says, could be shown from facts and circumstances, as well as by direct testimony of a witness.

That the passenger was standing upon the front platform of the car, and being, as he said, in ignorance of the situation of the track, his position on the car was not evidence of itself of negligence on his part.

Nor could the manner in which he was standing on the platform, being in the act of turning, or having just turned

around, be said to establish negligence on his part, if he was responding to a call of the conductor for his fare, and his attention was occupied by that.

#### Holder of Transfer Ticket Entitled to Wait for Car With Seat.

*Jenkins v. Brooklyn Heights Railroad Company (N. Y.), 51 N. Y. Supp. 216. April 26, 1898.*

Transfers must be given, upon demand, and without extra charge, by certain street railway companies, to "any passenger desiring to make one continuous trip," under section 104, chapter 676, of New York Laws of 1892. And the second appellate division of the supreme court of that state holds that it is not compatible with the provisions of this statute for a street railway company to make the transfer it gives depend for its operation upon the individual taking a car within 10 minutes, regardless of the condition of the car which it offers for such service.

A regulation that the passenger should take the first car which afforded him a seat or suitable accommodation, the court says, would meet all the requirements of the law, as it would evidence the good faith of the individual in his desire to make a continuous trip; but an arbitrary time limit, applying equally to the feeble and infirm, and which is only sufficient to allow a very narrow choice of cars, it declares, cannot be said to be such a reasonable regulation as the company is justified in making under the law.

The individual may waive his rights, and may submit to the annoyance and discomfort incident to travel in overcrowded conveyances; but the fact that thousands of persons do waive their rights each day does not justify a railway company in establishing a rule compelling people to do so, or to forfeit their rights under the law of the state.

Because the passenger could not change the contract, but was bound to accept the transfer ticket tendered, or none at all, he could not, therefore, be deemed to have given any assent to the conditions imposed, and which limited the right guaranteed by the statute.

In estimating the damages which the passenger may have suffered by being wrongfully ejected from the car, the court suggests that, if he was arrested upon the order of the conductor, and the arrest constituted a part of the act of ejection, it would be proper that the jury should be allowed to pass upon the facts, and to have the evidence before them.

#### Care Required of Street Railway Companies as Common Carriers.

*Lincoln Street Railway Company v. McClellan (Neb.), 74 N. W. Rep. 1074. April 21, 1898.*

The supreme court of Nebraska says that it is settled in its jurisdiction that street railway companies are common carriers of passengers. As such they are bound to exercise for the safety of their patrons more than ordinary care. They are required to exercise the utmost skill, diligence, and foresight consistent with the business in which they are engaged, and are liable for the slightest negligence. This is the liability imposed by the common law on all carriers of passengers for hire.

Moreover, the law presumes that one injured while being transported by a common carrier was injured in consequence of the latter's negligence, and to escape liability it must show that it has discharged the full measure of its legal duty, and was in no wise to blame for the accident. It need



not, however, under the rules of the common law, acquit itself of all blame, and, in addition thereto, convict the person suing it of gross contributory negligence.

One cannot recover for an injury received while a passenger on a street railway if the accident from which the injury resulted was due in part to his own want of ordinary care. And in an action to recover damages in such case, an instruction which informs the jury that, the injury being shown, the carrier, to escape liability, must prove that the passenger was guilty of gross contributory negligence, is erroneous.

The supreme court further holds that section 3 of chapter 72 of the Compiled Statutes of Nebraska of 1897, providing that "every railroad company, as aforesaid, shall be liable for all damages inflicted upon the person of passengers while being transported over its road, except in cases where the injury done arises from the criminal negligence of the person injured," etc., has no application to street railways.

Because it has none, the liability of a railroad company in Nebraska is that of an insurer, while a street railway company is only answerable for the failure to exercise the highest degree of care.

In the common understanding, the court says, too, a railroad and street railway have always been separate and distinct things.

#### Liability in Laying Tracks on Official Grade.

*Bancroft v. City of San Diego (Cal.), 52 Pac. Rep., 712. March 25, 1898.*

Here was an action brought against a city to recover for damages suffered from a change in the grade of a street upon which abutted the property of the party suing. In reversing a judgment obtained by the latter, the supreme court of California says that no liability on the part of the city is created by an ordinance establishing a grade. Ordinarily, the grade must be established at the same time over many streets, in order that they may be so related to each other as to permit drainage. A system must be established throughout a district. However, it does not follow that all the streets must be actually graded at once, and the municipality does not thereby undertake that they ever will be actually graded.

When, therefore, a street railway company, for its own pecuniary advantage, lays its track upon streets which the city is not prepared to grade, and perhaps will never have occasion to construct, the court declares that it is but just that the railway company should assume the liability for such work.

Continuing, the court says that it sees no reason for holding that the railway company is in any sense the agent of the city in the work. The grant of the franchise does not impose upon the company the duty of cutting down or filling up a street. It may do so or not, as its interests prompt. And, when it changes the grade for its own purposes, it must necessarily be at a point where the city has not found it necessary to construct the street or actually change the grade, and has not in the statutory mode declared its intention of doing the work.

In this case, the railway company did not construct a street, but, on the contrary, in constructing a roadbed 23 ft. wide on the new grade established by the city, it ruined the street which had already been made.

For these reasons, the court maintains that, notwithstanding the street railway company had a franchise from the city granting it the right to construct and operate its street railway, and requiring it to place all its tracks on the official grade, it took the privilege yoked with the liability, and was therefore liable for the damages, if any, caused by the work which it did.

#### What is Required at Deep Grades Leading to Railroad Crossings.

*Flournoy v. Shreveport Belt Railway Company (La.), 23 So. Rep., 465. April 4, 1898.*

Persons manning and operating street cars are expected to be careful at the crossings. The company must exercise reasonable care to provide men enough to properly control a train consisting of a motor car and a trailer.

At deep grades leading to railroad crossings, there should be a motorman and conductor aboard the train, and in charge. There was only a motorman, in this case, and the supreme court of Louisiana, which makes these statements, holds that the injuries occasioned by the collision between the street cars and the passing train at the crossing were injuries for which the street railway company must be held responsible to damages. The loss of control of this train, consisting of two cars, a motor car and a trailer, and its gliding down the rails and colliding with a passing railroad train, the court says, were manifestly owing to the inexperience of the motorman, or the absence of an additional man to assist in properly applying the back brakes, and in either case the company was responsible for the injuries received.

Some further light on the same subject is furnished by the case of *Russel* against the Shreveport Belt Railway Company, decided by the same court, the same day; 23 Southern Reporter, 466. It shows that there had been a conductor on these cars, but he had got off a short time before—some distance from the place of the accident—leaving the cars in charge of the motorman alone, who had only had a few days' experience as motorman, and lost control of the cars so that he could not stop or check their sliding down the incline to the railroad crossing.

The court declares that the ordinary care due passengers was wanting.

That a lad who was a passenger on the trail car jumped to the back brake, and tried to help the motorman by applying that, it holds did not have the effect of relieving the company from responsibility.

Nor does it permit it to change its decision against the company that the person suing in this second case jumped off just before the collision and fell on his shoulders, partially dislocating one of them and bruising an arm, while some of the passengers who remained in their seats escaped without any injury.

As abstract law, the court also here says that street car companies must exercise reasonable care to provide a sufficient number of men to properly move and operate their cars.

#### No Suit in Name of Attorney General for Private Ends.

*People ex rel. Moloney, Atty. Gen., v. General Electric Railway Company (Ill.), 50 N. E. Rep., 158. April 21, 1898.*

Notwithstanding the elaborate pleadings and numerous points raised in this case, which was commenced by a bill or information in the name of the people of the state, on the

relation of M. T. Moloney, attorney general, filed in the circuit court of Cook county, March 9, 1896, asking for an injunction against the General Electric Railway Company to prevent it from constructing its railway on certain streets in the city of Chicago, and to restrain the city and its officers from granting a permit, as well as praying that the ordinance involved might be declared null and void, the supreme court finds it unnecessary to enter into a discussion of any other point than whether it was error in the chancellor to dismiss this bill before final hearing, if it was not prosecuted solely in behalf of, and for the interests of, the public, but in the interests of rival companies.

If the information in this proceeding was invoked by rival corporations to prevent the construction of this road, the supreme court says that it was an indirect method of procuring an injunction, such as it has held could not be procured by a private individual, when deciding that an abutting lot owner has no right to invoke the aid of a court of equity to prevent the construction of a street railway.

Where injuries are consequential, merely, it holds that a court of equity is not the proper jurisdiction to enforce a remedy, as a court of law is the proper tribunal for the determination of such questions between individuals and corporations, or between corporations; and that, what cannot be done directly cannot be done by indirection. On principle, it declares, it cannot be held that, where a private individual cannot maintain a bill for injunction in his own name, he may do so in the name of the attorney general, on an information in equity.

And the supreme court further holds that, to determine whether the proceeding is improperly invoked, a court of equity may go behind the parties on the face of the record, to see who are the real parties prosecuting the proceedings, and that this may be done even where the proceeding is in the name of the attorney general; and, if the proceeding is prosecuted and carried on for the exclusive benefit of an individual, or corporation, then the court may order an information in such cases to be dismissed.

Therefore, being convinced, as it says, by the evidence in the record in this case that the inception of this information, its progress in the court below, and what had been done in the supreme court, were in the interest of rival companies, and that, if sustained, it would be preventive of a healthy competition in the interest of the people resident in the territory where the road was proposed to be constructed, the supreme court holds that the chancellor who heard this case properly dismissed the information.

#### Rule Laid Down as to Contributory Negligence in Going on Track.

*Austin Dam & Suburban Railway Company v. Goldstein (Tex. Civ. App.), 45 S. W. Rep., 600. May 4, 1898.*

There was some evidence in this case which had a tendency to show negligence upon the part of both parties: upon the street railway company in running the cars at a high rate of speed, and failing to keep the proper lookout for persons on the track, and in failing to apply the brakes and stop the car to prevent running down the party suing; and, upon his part, in undertaking to cross the track in his buggy under such circumstances as the jury might consider as tending to show contributory negligence.

But the court of civil appeals of Texas says that it has not been able to find any case reported in that state where the

identical question of law raised in this case has been passed on as applied to the operation of street railways. Yet, upon principle, it thinks that, by analogy, that class of cases that lays down the rule upon the question of contributory negligence as to injuries sustained by a person when upon a steam railroad track, is applicable.

It holds that what is required in this as in other cases of this class is the exercise of ordinary care; and, when it is once ascertained that one entering upon the track of a street railway is lacking in caution and diligence, he should be held to the same responsibility as exists in other cases where the party suing may be guilty of contributory negligence.

The fact that the party suing was privileged to use the street, and that, in the exercise of this right, he was not required to observe the same degree of care and watchfulness that would be required in a case where he was entering upon the track of a railroad operated by steam, the court insists, would not lessen the degree of responsibility that attaches to his negligent conduct in exposing himself to danger, if it is clear that he was guilty of such conduct.

Consequently, the court holds that it was error to instruct the jury that the party suing would be excused from the effect of his contributory negligence, in placing himself in a position of danger, if the servants of the street railway company operating the car could have, by the exercise of diligence, discovered his peril in time to prevent running him down, although, in fact, there was no actual discovery, before the collision, of his perilous situation.

To make the case still plainer, the court says that the failure to discover his peril by those operating the car, when by the exercise of diligence it could have been discovered, was conduct which clearly constituted negligence; but this negligence did not excuse that of the party suing, whose own negligent conduct it was that exposed him to peril; the court adding that no recovery can be had in such a case unless a new act of negligence arises upon the part of those operating the train or car, which must consist in the actual discovery of the danger in time to prevent the injury.

#### Liability of Purchaser of Track for Continued Defects.

*Schaefer v. City of Fond du Lac (Wis.), 74 N. W. Rep., 810. April 12, 1898.*

The Fond du Lac Light, Power & Railway Company so constructed and maintained its railway track on one of the streets of the city as to render the street defective and dangerous for public travel. While such condition existed, Elihu Colman, with knowledge of the facts, it is said, purchased the railway track and left the same in the possession of the railway company, under an option to it to purchase the property from him, but without any agreement binding the railway company to remedy the defective condition of the street. After this, while things continued in that condition, a man standing on a high load of lumber, and endeavoring to drive his team across the track, at the point of danger stated, was compelled, by the sudden jerking of his wagon, to take hold of a stake, that he had fixed in a position where he could use it to steady himself, but which broke, he sustaining injuries by being precipitated to the ground, it is judicially stated, without fault on his part, his injury being attributable to the condition stated.



Under these circumstances, the circuit court decided, as a matter of law, that Colman was not liable for the injury complained of, because the defects in the street were not caused by, nor did they arise from, or were they produced by, him. But the supreme court of Wisconsin says that this reasoning hardly meets the facts of this case fully, leaving out, as it does, the element that Colman continued the defective condition of the street by allowing the railway company to hold under him without any covenant on its part to remedy such condition.

The supreme court says that the law is firmly established by the great weight of authority, that as between the owner of leased property and a mere stranger, the owner is liable for any injury to the latter, caused by a dangerous defect in the property existing at the time of the lease, unless protected by a covenant binding the lessee to remedy such defects; and that there is much authority that he is liable anyway, that is, that he cannot shift the liability for known existing dangers onto the lessee by a covenant to repair.

On these grounds, the court holds that Colman and the railway company as well, were primarily liable to the one who had been injured, and that the exhaustion of all legal remedies as to both was a condition precedent to the right of the latter to proceed against the city under the charter thereof, which provides that in all such cases the city shall not be liable till all legal remedies shall have been exhausted to collect the damages from the person or corporation whose wrong or neglect produced or caused the defective condition of the street.

The rule of law particularly established by this decision may be said to be, as stated by one of the judges, that if property, when in such defective condition as to be dangerous to persons lawfully in the vicinity thereof, be purchased by a person with knowledge of the defects, who leases it to another, especially if the lease does not contain a clause requiring the lessee to remedy the defects, and a person so lawfully in the vicinity of such danger, but having no connection whatever with such lessee, be injured thereby, such lessor is liable to such injured party; and he cannot escape liability from the mere fact of the lease to, or possession by, such other person.

#### Right to Make Crossings of Overhead Trolley Street Railways.

*Consolidated Traction Company v. South Orange & Maplewood Traction Company (N. J.), 40 Atl. Rep., 15. March 1, 1898.*

An injunction to prevent one street railway company operating the overhead trolley system from constructing a crossing over the tracks of another, against its consent, and without any offer of compensation for damages by reason thereof, was sought in the above case.

But the court of chancery of New Jersey holds, first of all, that a preliminary injunction cannot be granted upon the ground that the company sought to be enjoined has no right to make its extension across the street because its construction in that locality is unauthorized by law. The only ground upon which one company's right to equitable relief based upon the illegal construction and operation of another's railway can be granted, the court says, is the interference with the authorized business of the company, by competition carried on without authority of law. Such unauthorized competition with the business operated under a

legal franchise is a recognized ground of equitable as well as legal relief.

The only other legal injury which the complaining company could sustain by reason of an illegal extension of the other company's road beyond its authorized limits, the court explains, would be an injury common to the public or to all other owners of property; and such common injury affords no basis for equitable interference on behalf of the individual or property owner, to enjoin the illegal exercise of a public franchise. In such cases, jurisdiction for the purpose of deciding upon such illegal use is to be exercised only upon proper proceedings at law or in equity by or on behalf of the state.

Moreover, if a preliminary injunction against illegal interference with business to which a company has a right is sought, the court insists that the application therefor must be made promptly, which it does not consider is done by waiting in the neighborhood of two months after the other road is in operation, before the bill of complaint is filed.

Nor does the court endorse the second and principal ground upon which the right to a preliminary injunction was based, namely, that the construction by another company of a street railway across the complainant's tracks, and the operation of the former by the trolley system, would necessarily invade the complainant's property rights, as owner of the track and trolley system, and interfere with its franchise of operating its road.

So far as relates to the mere interruption of the operation of a street railway during the period of the construction of a crossing, the court holds that there can be no basis for compensation, for the first company's right to the use of the street must be subject to the right of the public to cross its tracks therein, and to the right of the public authorities to provide for crossing the tracks by any carriages or vehicles which have the right to use the street for travel, and to interrupt the company's operation in such reasonable manner as may be necessary to provide for the construction of the crossing, when the right to cross exists.

As to the permanent changes made necessary in tracks and wires by a crossing, the precise question involved for settlement is said to be new in New Jersey, while even the right to compensation for the taking or use of a street railway company's property such as is purely and necessarily incidental to the crossing of its tracks by street cars, moved either by horse or electric power, in the safest and most approved method, has not been expressly recognized. But there are New Jersey cases which settle that electric street railways, operated by the overhead trolley system with its poles and wires, are not additional burdens upon the soil of the highway, and that these structures may be placed in the public streets without compensation to the owner of the soil, subject to the right of the public of passage and other ordinary uses of a highway. They also settle that a steam railroad lawfully constructed across a public street cannot exclude the public from crossing its tracks by street cars operated by either horses or trolley, except to the extent that interference may be necessary to permit the lawful operation of the steam railroad at the point of crossing, and that without consent, and without compensation.

These principles, the court thinks, control the right of trolley companies (whose tracks are laid longitudinally in the public street) to prevent the crossing of their tracks, and it holds that they can only prevent this crossing so far as

the crossing interferes with or prevents the operation of their roads or the exercise of their franchises.

The right of one street railway to cross another street railway already constructed is the same legitimate use of the highway as the construction and operation of the original road; and the original right to construct and operate a road in the public streets is necessarily subject to all legitimate purposes of crossing.

Nor does the court consider that the fact that the crossing, as proposed, necessitates some actual interference with the tracks and wires as constructed, and to some extent changes thereafter the exclusive use by the complainant company at the crossing, will prevent the crossing by a similar street railway company, without compensation, if made under the proper legislative authority; for these changes are the necessary result of the development of the method of operating electric roads at their points of crossing, and especially when they are such as are made necessary, as the best and safest methods now attainable for the safety and convenience of the public in the operation of both roads at the point of crossing. They are therefore changes and burdens in the use of its tracks and trolley system to which the original right to lay and construct them is necessarily subject, and, in a legal point of view, are different only in degree, and not in character, from the changes in the property and control of its tracks made in the ordinary horse car crossing.

And inasmuch as the complainant company's tracks and wires were originally laid and constructed subject to the right of the proper authorities to disturb them for the purpose of legitimate public travel in the public street across its tracks, and the changes and disturbances are necessarily incident to such crossing, the court holds that these are not the subject of compensation.

Jurisdiction to control the construction of such a crossing, if the parties cannot agree, the court further states, can, undoubtedly, be exercised by a court of equity; and, where the right to construct a crossing exists, it says, a court of equity will, if necessary, and on application of either party, interfere to control the construction. And such equitable jurisdiction relating to the joint use of the public highway would probably extend to the settlement of all questions relating to the construction, operation, and maintenance of the crossing in case the parties did not agree.

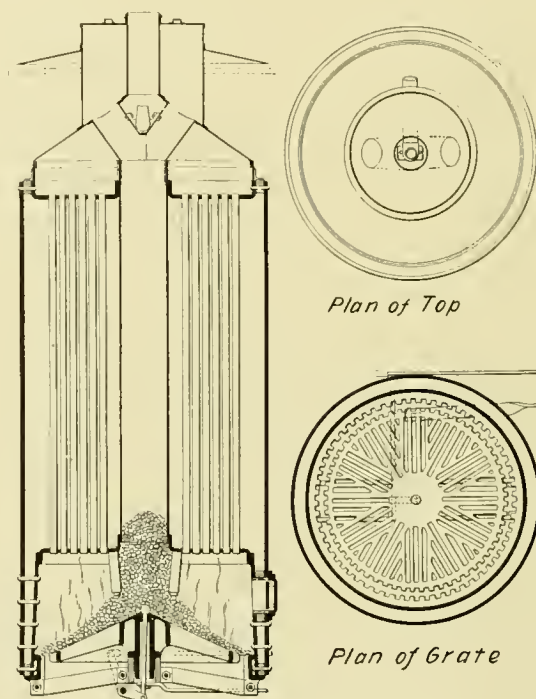
Finally, the court declares that the company seeking to make the crossing, of course, has no right arbitrarily to select its own time of erecting the crossing, but is bound, if no agreement is made, to give due notice, both of the time and manner in which the crossing is proposed to be made.

Thus did the court reach the conclusion that, on the merits of the case, the complainant company was not entitled to compensation for damages to its property by the proper construction of the crossing under consideration; and as the crossing, when properly erected, would not interfere with the exercise of its franchises, the application for preliminary injunction on the ground of right to compensation must be refused. And this conclusion, it maintains, agrees with the decisions of the courts of other states, in cases involving the rights of crossing in public streets, so far as it had been referred to them.

Early in May underground conduit cars were placed in operation on the 8th avenue line in New York.

## MOTOR CAR FOR DETROIT & LIMA NORTHERN.

We have previously made mention of the intention of the Detroit & Lima Northern Railroad to place some dummy cars in service in order to increase the number of trips and prepare for trolley competition. The Baldwin Locomotive Works are now building a motor car for this road which is in some respects similar to that built for the Cincinnati,



BOILER FOR DUMMY CAR.

Hamilton & Dayton Traction Company and described in the REVIEW for March. The cylinders are compound  $9\frac{1}{2}$  and  $16 \times 18$  in.; no condenser is provided. The boiler is vertical and self-firing, and is carried on the driving truck forming the center pin of the car. The boiler which is shown in section and plan in the accompanying illustration is 60 in. in diameter and has 630 sq. ft. of heating surface. The fuel is anthracite coal.

## INCREASED POSTAL SERVICE.

The Postal Department at Washington is contemplating a change in the street railway postal service, Chicago, about July 1, which will result in greatly extending it. At the present time there are in this city four street railway postal car routes, all established in November, 1895, and all on cable lines, each with two cars; this service is in charge of the superintendent of the railway postal department. The cost of the service is about \$11,000 per year, which does not nearly pay the expense incurred by the railways in handling the cars.

It is proposed to transfer these cars to the department of collection, and put postal cars on the cross-town electric lines, and connect with the present trunk lines. The estimated cost of the increased service is \$50,000 per year.



**A CONVENIENT CONSTRUCTION WAGON.**

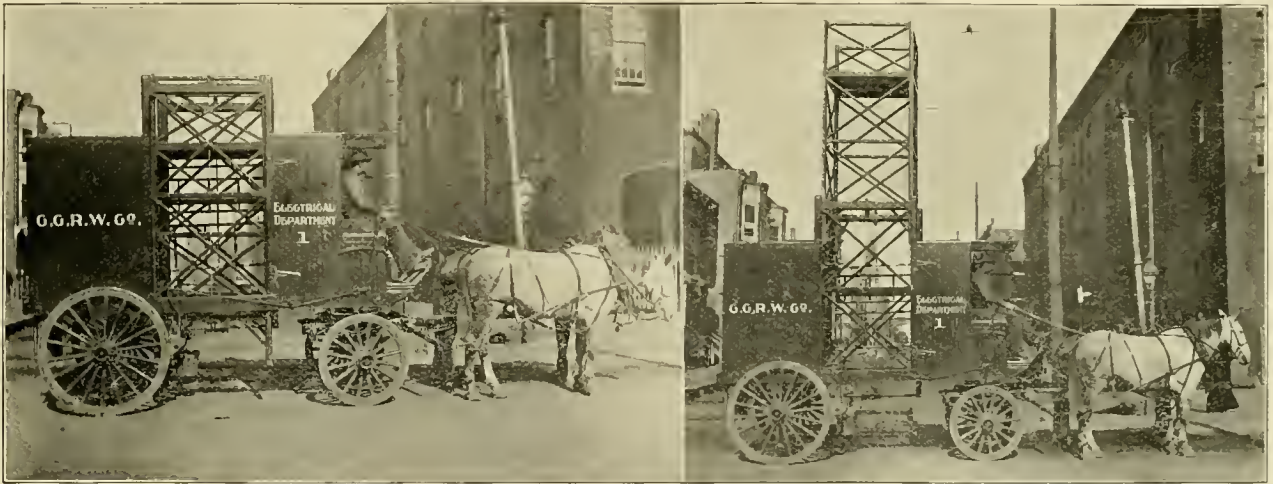
The construction wagon here illustrated has just been completed in the repair shops of the Chicago City Railway Company. The company does all the overhead construction, and line work and this department is under the direction of J. C. Baker, the designer of the wagon. The wagon consists of the adjustable tower, and three compartments for the linemen's tools. The platform rail lowered is 11 ft. 5 in. from the ground, but can be raised to a height of 21 ft. A wire rope is attached to the frame of the wagon and passes under two pulleys beneath the platform and around a windlass underneath the wagon body. A shaft extends from the windlass to the rear of the wagon and the platform is raised or lowered by a crank handle which can be removed.

Under the seat there is a compartment for solder, acid and a fire pot outfit. In the front compartment are kept coils of rope, block and tackle, with hooks for curve and

the work by standing over the hole. As she seemed determined to remain there the workmen started another hole a few feet away. She left her post and stood over the second hole. The workmen left it and went to work again on the first hole. Mrs. Gunn went back and interrupted as before. The work went on in a similar manner during the morning hours, the woman playing tag with the railroad company's workmen, much to the amusement of the crowd who gathered around and watched the fun."

**THEATRICAL ENGAGEMENTS.**

Managers operating parks and using attractions have found that in dealing with theatrical artists it is wise to have a very distinct understanding of the obligations on each side. Manager Wyman, of the New Orleans Traction Company, anticipates differences by printing on his resort letter-heads on which amusement contracts are written the following conditions:



CONSTRUCTION WAGON OF THE CHICAGO CITY RAILWAY.

trolley wire. The doors open at the sides of the wagon. Access to the rear compartment is had by a door at the back. Partitions are arranged along the sides of this compartment for bolts, nuts, washers, hangers, insulators, ears, tools, etc. These compartments are water tight and the tools and line material are in good condition and free from rust. The step in the rear can be folded up. The under-running gear enables the wagon to be turned around in a very small space. A ratchet brake is provided, so that the wheels of the wagon can be set and remain so during the progress of the work. The design is such that the platform, as well as the top of the wagon, which is also used, is thoroughly insulated. The wagon with all accessories weighs 3,750 lbs.

**OBSTRUCTING THE WHEELS OF PROGRESS.**

The Syracuse (N. Y.) & Suburban Railroad has met with considerable opposition in the construction of one of its extensions and the experience of a gang in digging a post hole where it was not wanted is thus described in a local paper:

"It had not progressed far when a woman, who was said to be Mrs. May Gunn, came out of the house and stopped

"Artists engaged at the West End agree not to appear at any other place of amusement in the city previous to, or in two weeks after, this engagement unless by permission of party of the first part or his authorized agent.

"Incompetency, drunkenness or misconduct will be considered sufficient reason for annulling a contract without notice.

"All billing matter, photos, property and scene plat, time of act, must be sent 10 days in advance of beginning of engagement.

"Artists accepting engagement consent to be governed by the rules adopted by the management for the resort."

**WIRE STOLEN IN BROOKLYN.**

May 14 Joseph Blumenstock, 18 years old, with no permanent home, was arrested with a quantity of copper wire in his possession and two days later was remanded for trial, charged with having stolen it from the Brooklyn Heights Railroad Company. According to the story he told the police Blumenstock is the member of a gang who have been stealing from the company for a considerable period.

# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

The accident at a central lighting station, at Palmer, Mass., which resulted in the destruction of the station by fire, calls attention to a new danger, or at least one but little appreciated heretofore. The plant was operated by water power and the governor consisted of an apparatus in which oil was circulated under a pressure in excess of 200 lbs. While the superintendent and an assistant were making some adjustments, some part of the governor burst and the oil thrown out was ignited by a stove in the room. The two men were badly burned and the building destroyed.

\* \* \*

The Monongahela Water Company, of Pittsburg, is now engaged in building an elevated track some 30 ft. above the street and 500 ft. long for the purpose of transferring its coal from the railroads to the power house in cars. The elevation is sufficient to permit the coal being dumped into the bins at the boiler house by gravity, and thus it does away with the triple handling of the coal heretofore necessary when it has been stored in the yards. It appears to us that there are many street railway power stations which are large enough to make it economical for the companies to build similar structures.

\* \* \*

Robert Hammond in a paper read at the last meeting of the English Institute of Electrical Engineers, gave a great deal of information concerning the cost of electrical energy in the lighting stations of the United Kingdom. A number of stations show great reductions in cost, the reductions being effected by reason of better systems of working. The figures for the cost per kilowatt-hour in cents are: Edinburgh, 2.26; Manchester, 2.90; Nelson, 3.34; Portsmouth, 3.42; Leeds, 3.46; Whitehaven, 3.50; Liverpool, 3.54; Bradford, 3.62; Glasgow, 3.84; Preston, 3.88; twenty-six stations, including four in London, range from 4 to 6; twenty-nine lie between 6 and 8; ten lie between 8 and 10; eight lie between 10 and 24. These costs include fuel, oil, waste, water, wages, management, rates, rents and taxes. It is predicted that when the output at Leeds reaches 5,000,000 k. w. h. per annum, the cost per unit will be reduced to 3 cents.

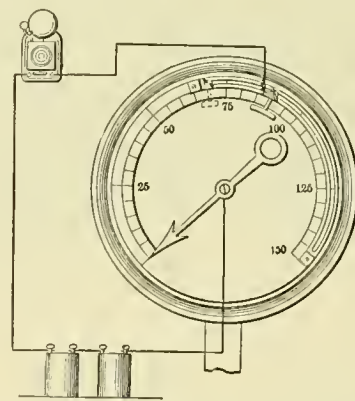
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A 48-hour test of the new electric power plant of the Boston Elevated Railway, at Harvard square, Cambridge, was recently conducted by the students of the Massachusetts Institute of Technology, over 100 being employed in the work. This plant represents the latest development in power station practice and comprises three compound condensing engines of 1,800 h. p. each. In the boiler room, electric motors are used for driving the feed-pumps. Economizers are used for heating the feed. The steam pip-

ing is similar to that at the Sullivan square station of the company, the steam being brought to the high-pressure cylinder through a separator, and the piping being beneath the engine, and arranged so that either cylinder may be run at high pressure. The air pumps are of the jet condensing type, run by a separate engine. The test was made as complete as possible and included the auxiliary apparatus.

\* \* \*

The accompanying cut illustrates an electrical steam gage alarm which was described in a recent issue of the "American Machinist." The object sought is to have the ringing of bell announce when the steam pressure falls below or rises above the desired limits. A curved slotted plate is permanently fixed to the face of the gage, and an inwardly projecting T piece is adjustably fastened to it by a bolt and thumb nut. The bell and battery being provided, and both



the T piece and the gage pointer being properly insulated from the body of the gage, one wire is connected to the former and the other to the latter. When the gage pointer comes in contact with the T piece the circuit is completed and the bell rings. If it is desired to have a low pressure as well as a high pressure alarm a second T piece is placed

at the proper point; two circuits with bells of different tones could be used to advantage for the two alarms.

\* \* \*

Some time since we called attention to the fact that many engineers in preparing specifications for boilers insist that bidders rate their boilers upon the area of the heating surface, and that such a requirement is an injustice to the boiler manufacturers. A boiler should be rated according to its steam making capacity, and the steam making capacity of a square foot of heating surface varies greatly according to its position in the boiler. For instance that portion of the heating surface in the firebox of a locomotive is vastly more efficient than the tube surface (1 sq. ft. of firebox surface has been placed as equal to 10 sq. ft. of tube surface), and the rear ends of the tubes more efficient than the forward ends. It also varies with the type of boiler. If this rule of basing the rating on the area of the heating surface be insisted upon, and the recommendation of the American Society for measuring the tube surface be fol-



COST OF POWER FOR ELECTRIC RAILWAYS.  
Output Measured by Wattmeter in Each Case.

STATION.	MONTH.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel per k. w. h.	Price of Fuel per Ton of 2,000 Lbs.	Kind of Fuel
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.	Total.						
1.....	Mar.	1,296,716	.311	.181	.034	.030	.058	.614	3.7	.8	9.3	2.96	\$2.12	Bituminous.
3.....	"	249,334	.445	.212	.051	.011	.028	.747	4.45	6.1	.....	4.18	2.13	"
4.....	"	328,535	.359	.197	.032	.....	.025	.613	3.77	3.89	.....	3.32	2.16	"
5. Metropolitan Elevated, Chicago.	"	1,656,864	.346	.143	.018	.....	.028	.554	4.6	1.8	5.86	3.81	1.82	"
8.....	"	905,904	.534	.225	.067	.....	.093	.919	.....	.....	.....	.....	.....	.....
9.....	"	223,050	.476	.410	.034	.....	.069	.929	.....	.....	.....	.....	.....	.....

lowed, a further injustice is done the manufacturer of water tube boilers. The code says that the heating surface of the tubes shall be taken to be the exterior surface, whether they be fire tubes or water tubes. The real heating surface of a boiler is the area exposed to the fire or hot gases, since water is many times more efficient than gases in conducting heat, and the water may be relied upon to conduct away all the heat which the plate or tube receives from the gases. The external area of a 1-in. tube is 17 per cent in excess of the internal area, and the external area of a 4-in. tube is 7 per cent greater than the internal area.

Chas. W. Baker discussed what constitutes heating surface in a paper before the A. S. M. E. and in conclusion analysed the reasons which have been urged in favor of taking the external tube area in all cases.

1. It is alleged that the manufacturer of water-tube boilers has an advantage since he can claim more heating surface with a tube of given dimension. This is true and it is quite proper that he should claim it since he really has.

2. That the external measurement increases the heating surface of the boiler. This is an absurd claim since the capacity is not increased.

3. It is urged that the exterior area should be taken for the sake of uniformity. The practice is not uniform, however, among engineers.

4. It is easier to compute the exterior area since the outside diameter is in even inches. This claim is not deserving of very serious consideration.

\* \* \*

**Standards for Engine Testing.**

At the recent meeting of the American Society of Mechanical Engineers two papers dealing with this subject were presented: one by Bryan Donkin, of London, Eng., and one by George H. Barrus, of Boston.

Mr. Barrus points out that it would have been the natural course to determine a general standard method for engine tests, before determining the methods of testing individual types. The society has adopted a standard method for making duty trials of pumping engines (1890), and methods for testing locomotives (1893), and its code for boiler tests adopted in 1885 has just been revised. The recommendation is made that a standard for general engine testing be prepared and the pumping and locomotive standards be revised where it is necessary to bring them all into harmony. This would give the society two standard systems for testing, one for boilers and one for engines.

Mr. Barrus makes the following suggestions for a standard system of testing engines:

"The principal data required for an efficiency test of a steam-engine, are the weight of steam consumed and the amount of power developed. These two elements of data are fundamental whatever the type of engine, and whatever the class of work performed. It is evident at the outset, that a system of engine testing applicable to all engines would be a method of determining these quantities. Consequently, the proposed standard would relate primarily to these two things and to the expressions of efficiency derived therefrom.

"If, for the moment, we pass by the steps required to obtain the necessary data, and take up the problem of bringing into uniformity the methods of reporting the results obtained from different classes of engines, the subject arranges itself in a simple manner. The desired uniformity will be secured if the tabular summary of results is expressed in two sections; the first section dealing with such data as apply to the working of the steam in the cylinders, apart from the peculiarities of the service which the engine performs, and the second section giving the data and results pertaining to the special individual work. Following out this scheme more in detail, the first section of the tabular report would contain all the data of measurements of feed water, of steam used by the jackets and re-heaters, if these were employed, the quality of the steam, the weight of steam used by the auxiliary apparatus, and all the data of the various pressures, temperatures and speed relating to the work of the engine, including the pressures and other data obtained from the indicator cards. It would give the horse-powers developed, the weight of steam consumed by the engine and by the auxiliaries in a unit of time per unit of power, the deductions from an analysis of the indicator diagrams, and the total number of heat units consumed in a unit of time per unit of power. It would also present the standard decided upon for the expression of efficiency.

"The second section of the tabular report would vary with each class of engine. In this section, there might be five sub-divisions, one applying to each main class of engines.

"The classes which suggest themselves to me are as follows:

- "1. Factory engines, or engines employed in the production of power in general.
- "2. Pumping engines.
- "3. Locomotives, (a) shop tests, (b) road tests.
- "4. Engines employed in generating electricity.
- "5. Marine engines.

"In the first sub-division of the second section, that relating to engines for general work, few additional data need be given, beyond those found in the first section. Engines in general are employed in generating power for such a variety of mechanical operations, that the simple expression of efficiency, based on the quantity of heat or steam used per gross or net horse-power per unit of time covers essentially the whole ground. This section might, however, present the data and results of a coal test of the engine, where this was made; in which case, it would give the weight of coal burned, and all the various results depending upon it.

"The second sub-division of the second section, that relating to pumping engines, would present the special data in regard to the work of the water end of the engine, such as the quantity of water pumped, the number of feet lifted, and all the special data which are given in the report of the duty trial committee in Vol. xii. of the 'Transactions.' In this section would appear the results expressed in terms of 'duty,' including the standard based on one million heat units.

"In the third sub-division of the second section, viz., that relating to locomotives, there would be two parts; one pertaining to shop tests and the other to road tests; and in both of these, there would be the special data pertaining to the work of the locomotive, as formulated by the report of the committee on locomotive tests in Vol. xiv. of the 'Transactions,' including the standard of efficiency therein determined, viz., the quantity of so-called 'standard coal' used per dynamometer horse-power per hour.

"In the fourth sub-division of the second section, that relating to engines for driving electric generators, data would be given embracing the quantity and intensity of the current generated, the electrical horse-power developed, and the efficiency of the generator. In the case of railway engines, this would also include the current delivered to the motors on the line, and expression of efficiency based on car mileage.

"The fifth sub-division of the second part, that relating to marine engines, would present such data as pertain specially to marine work, such as the quantity of coal consumed and the results bearing upon it, the speed of the vessel, the slip of the screw, and the tonnage moved a given distance per unit of power.

"The above is an outline giving the main features of one method of formulating the tabular reports so as to secure the objects in view.

"Returning now to the methods of obtaining the data, one of the most important elements of data required is the quantity of work which the steam performs. The work done by the steam in an engine cylinder has in the past been ascertained, and probably will continue to be ascertained, by the use of the steam engine indicator. The reliability of this instrument is the foundation upon which a correct determination of the engine's efficiency rests. How the indicator should be applied, how it should be operated, how its springs should be calibrated and how the diagrams which it produces should be read and investigated, are questions which should be settled by the proposed standard method of engine testing; and to these questions little attention has been given and little required at the hands of previous committees. It may not be out of place to recall the fact that there is no accepted method amongst engineers of calibrating indicator springs; and it seems to me that in the work suggested, investigation and recommendation should be made as to the best mode of dealing with this important subject.

"If the suggested arrangement of the tabular reports be followed, they would be preceded by a similar arrangement of the methods laid down for determining the various data. In the first place, directions would be given for ascertaining the data of the first section, or that applying to all engines, whatever their type; and these would cover the ground with that completeness which characterizes previous reports. Much of the material applicable to engines in general, given in the reports of the duty trial and locomotive test committees would appear in this section, and would there be dealt with once for all. The second section would similarly be divided into the sub-divisions named, and in each of the various sub-divisions complete directions would be given for obtaining the special data applying to the individual case. In the matter of duty trials and locomotive tests, the sub-divisions would deal with all the directions laid down in the previous reports."

Mr. Donkin points out the good work done in formulating the boiler, pumping engine, and locomotive codes, and recommends similar standards for marine engines, factory engines, rotary engines and gas and oil motors.

In an appendix Mr. Donkin gives the preliminary report of a committee of the London Institute of Civil Engineers, which has reached the following conclusions:

"1. That the statement of the economy of a steam engine in

terms of pounds of feed-water per indicated horse-power per hour, is undesirable.

"2. That for all purposes, except those of a scientific nature, it is desirable to state the economy of a steam engine in terms of the thermal units required per indicated horse-power per hour (or per minute), and that if possible the thermal units required per brake horse-power should also be given.

"3. That for scientific purposes the thermal units that would be required by a perfect steam engine, working under the same conditions as the actual engine, should also be stated.

"The proposed method of statement is applicable to engines using superheated steam as well as to those using saturated steam, and the objection to the use of the number of pounds of feed-water, which contain more or less thermal units according to conditions, is obviated, while there is no more practical difficulty in obtaining the thermal units per indicated horse-power per hour than there is in arriving at the pounds of feed-water.

"For scientific purposes the difference in the thermal units per indicated horse-power, required by the perfect steam engine and by the actual engine, shows the loss due to imperfections in the actual engine.

"A further great advantage of the proposal is that the ambiguous 'efficiency' is not required."

Mr. Donkin adds in a second appendix a number of suggestions as follows:

"1. Percentage of Water in Cylinders.—The best way of representing graphically the percentage of water in the cylinder of any steam engine after cut-off is a subject well worth considering. If possible, it should be on the same base line as the indicator diagram.

"2. 'Cards.'—The word 'cards' should, in the writer's opinion, be abandoned in all future reports and discussions on this subject, and the words 'indicator diagrams' always substituted for it. In taking diagrams from steam engines, no 'cards' are or ever have been used.

"3. Steam Engine Indicators, also Gas and Oil Engine Indicators.—The public should know the opinion of this society as to the best types to be used in view of the various speeds (from fifty to five hundred revolutions per minute), and the temperatures of saturated or superheated steam or gas in these motors.

"4. Indicator Springs.—A standard method of testing indicator springs hot in their indicators. Should such be recommended by the committee?

"5. Position of Indicators on Cylinders of Motors.—Attention and advice should be given on the question of placing an indicator, whether on a vertical or a horizontal cylinder. The two ends of a cylinder should never be joined up by pipes. Each end of each cylinder should have its own indicator, and each pipe fixed with as few bends and made as short as possible.

"6. Smoke Scales for Observation of the Degree of Smoke every two minutes during a ten-hour test.—As the question of smoke and its prevention is likely to come with increasing prominence by smoke scales, and standardizing the observations made on it, should, the writer thinks, be dealt with by a committee. The best method hitherto proposed is probably that suggested by Professor Ringelmann with five standard smoke scales, and published in November last in the 'Engineering News.'

"7. Power Required for Driving the Engines Themselves.—When engines are tested, whether using steam, gas or oil, they should, whenever possible, be indicated when driving themselves only, and this information should be added in all tests.

"8. Leakage.—Pistons and valves should be tested for leakage of steam or steam and water, wherever possible.

"9. Temperature of Cylinder Walls.—The temperature of the cast iron cylinder and cover walls should be more often taken in scientific tests, with the best electrical instruments now available. Hence before municipal authorities, the best way of representing the paper by Professors Callander and Nicholson (read before London Institute Civil Engineers this winter) can be referred to as the best on this subject. The temperature of cylinder walls is of great importance as having a large influence on the condensation of steam.

"10. Steam Jackets.—Whenever any parts of cylinders or receivers are jacketed with steam, a small pressure gauge, pre-



viously checked, should be fixed on each jacket, to determine the actual pressure of steam. A small tell-tale quarter-inch cock, opening into the engine-house, should also be provided on the same gage fittings to enable the engineer to see whether air, steam or water comes out when the cock is turned on. In important tests such cocks should be fixed at the lowest and highest parts of each steam jacket."

**HOSE BRIDGES FOR CHICAGO FIRES.**

When a fire occurs in the down town district, in Chicago, on one of the surface loops all the lines of the company using that loop are in danger of being tied up for a long period. Crossover switches are placed on the trunk lines before they come to the loops but this provision is inadequate for the large number of cars. The street car tracks

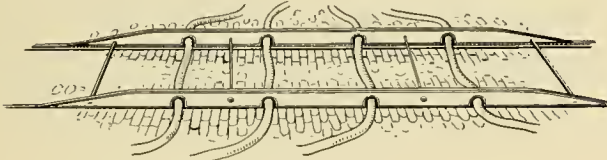


FIG. 1.—HOSE BRIDGE FOR ELECTRIC LINES.

are more often blockaded by the hose lines than from the burning building or any other cause.

The hose bridge used by the North Chicago Street Railroad Company for the trolley tracks resembles the bridges which are in service in many other cities. It is shown in Fig. 1, and consists of a 2-in. oak plank on either side bound with 3-16-in. strap iron. Four semi-circular holes are cut to accommodate four lines of hose. Tie rods are spaced at intervals to hold the bridge to the proper gage. The bridge is about 18 ft. over all and the inclines are such as to permit the cars to pass over it easily.

It has been a much more difficult problem to design a suitable bridge for the cable tracks. The latest one, which has been perfected by Superintendent F. L. Fuller, is shown in Figs. 2 and 3. The legs of the tripods are 21 ft.

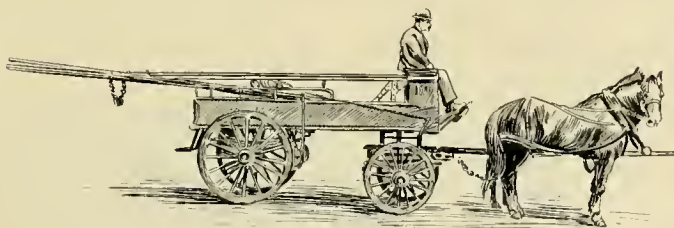


FIG. 2.—HOSE BRIDGE, NORTH CHICAGO STREET RAILROAD.—FIG. 3.

in length and consist of tubing into the interior of which is driven a wooden pole. The bridge proper is divided into two parts each 12 ft. long. The floor is of 7/8-in. plank and the rest of the bridge is constructed of light angle iron. The two halves fit together and are held in place by two long pins.

The bridge ready to be sent to the fire is shown in Fig. 2. As soon as it is taken to the scene of operation the two halves are laid across the tracks and pinned together. The

lines of hose, any number less than nine, are placed in the bridge and a tripod set on each side of the tracks. A block and tackle is attached to an eye bolt in the apex of each tripod and the bridge with its load of hose is drawn up to the proper height. This whole operation can be performed by three men in less than eight minutes. The particular advantage of this bridge is that the lines of hose when filled with water can be lifted into place, which would be a very difficult thing to do with almost any other form.

Two of these bridges are kept in the barn at the rear of the general offices. In the office is located a city fire alarm; and as soon as the gong sounds the location of the fire is determined. If the fire is a serious one the wrecking wagon is sent to the barn and the bridges, which are suspended overhead, are let down into the wagon and quickly dispatched to the proper point. Although designed especially for cable cars the trolley cars pass under it by drawing down the trolley pole. As one fire is liable to blockade nearly all the cars of a system this bridge will save its cost many times over during one emergency.

**OPENING FOR ELECTRIC RAILWAYS IN CUBA.**

Wilfrid Skaife, discussing the "Future Industrial Opportunities in Cuba" in the current number of the "Engineering Magazine" says: "No electric roads exist in Cuba at the present time, but their immediate institution may be looked for. It is a singular fact that the travel on the various coasting steamers, on the vessels running up the small rivers, on the railroads, and on the few 'busses' that run to the suburbs of the larger towns, is very much larger than one would expect from the apparent nature of the people and their means. The writer has constantly been surprised at the over-crowding of these means of travel, and understands, on the best of authority, that the business is a very paying one indeed. The rates charged are usually exorbitant, but the travel goes on even when the possibility of being dynamited en route adds to the general discomfort.



"The writer traveled last winter on a train with pilot engines in front, an armored car behind, and amid the liveliest rumors of trouble on the road, and though there were few first-class passengers, the other cars were filled with people traveling. God knows why! The extension and improvement of steam railways, opening up the country and giving better service, is sure to be a very paying business in the future, while there are a number of towns in which electric roads could be run to advantage, besides Havana itself."

**THE KIDDERMINSTER & STOURPORT TRAMWAY.**

The latest electric railway in England to be put in operation is the interurban line running between Kidderminster and Stourport, two cities of about 25,000 and 4,000 inhabitants. In reference to this road the "Electrical Review," of London, says:

The Kidderminster and Stourport line is not an extensive one, but it is of special interest and importance at the present moment, because, since the American invasion, it may be considered the first line erected by British manufacturers. The steam plant, generators, cars, motors, overhead wire and material all have been made in this country and the Brush Electrical Engineering Company, the principal contractor, is to be congratulated, not only upon the successful completion of the line, but also because it had the good sense to copy some of the best features of American practice.

The British Electric Traction Company, the largest street

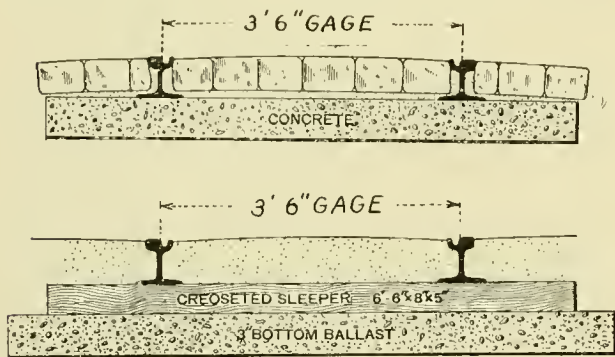


FIG. 1.

railway corporation in England, and having projects on hand involving an expenditure of \$15,000,000, received parliamentary permission to construct this line in 1896. The line is single track with turnouts at intervals and a spur at Kidderminster, which runs for a short distance at right angles to the general direction of the road. The gage is 3 ft. 6 in., and girder rails, weighing 75 lbs. to the yard are used. In Kidderminster the track is laid on a bed of con-

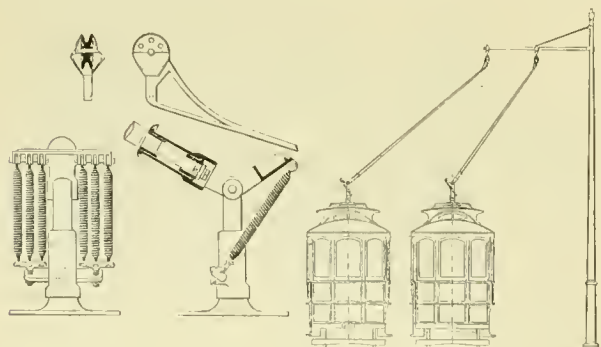
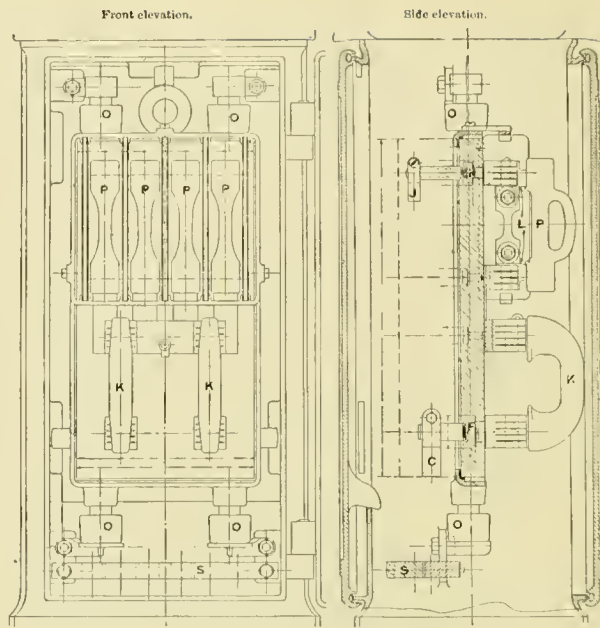


FIG. 2.

FIG. 3.

crete 6 in. thick as shown in the upper section of Fig. 1, but outside of the city the rails are laid on ties with a macadam filling as in the lower section of Fig. 1. Chicago bonds were used and no copper return feeders were found necessary. The line crosses the Great Western Railway at a grade which is very exceptional, but every precaution is taken to make it safe.



o and s, Clamp cable sockets; k, Main switch carrying 400 amperes; o, Oil insulators; s, Section switch; l, Clamp for cables.

FIG. 4.—FEEDER BOX.

The trolley wire is double throughout the entire length to avoid all overhead switches, and they are suspended from brackets from side poles. There are a number of obstructions to prevent the poles being planted all on one side of the road, but the track extends continuously along the same side. To provide for this divergence of the wires from the track the Dickenson side trolley was adopted. The details of the trolley are shown in Fig. 2, and its appearance in operation may be seen from Fig. 3. The trolley pole is a light steel tube 15 ft. long, tapering from 2 3/8 in. to 3/4 in. outside diameter and fitted with a swivel head which permits the wheel to turn and adapt itself to any position of the trolley wire. The trolley base is supported on four insulators.

The trolley wire is divided every half mile by section insulators and connection is made at these points with the feeders through feeder boxes. Two feeders run from the

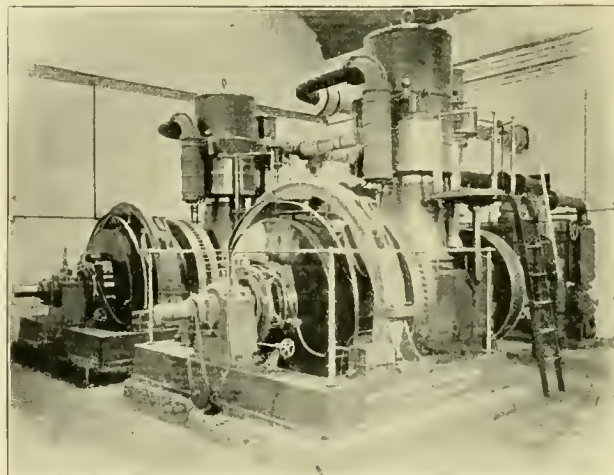


FIG. 5.



power station, one of 78,000 c. m. and one of 305,000 c. m. cross section. They consist of stranded cables, lead covered and armored and buried in the ground to a depth of 18 in. The feeder boxes, shown in Fig. 4, are 4 ft. 8 in. high and are placed on the posts supporting the section insulators. Each contains two main knife switches in connection with a bus bar, from which there are two cut-out fuses which feed both ways on the double trolley wire. The feeder switches each have a capacity of 400 amperes and each of the four section switches can carry 50 amperes.

The power house is located between the Stour river and the Worcestershire canal, being about a mile from the Kidderminster terminus and  $3\frac{1}{2}$  miles from Stourport. In the boiler room there are two water tube boilers, each having 1,218 sq. ft. of heating surface. A Green fuel economizer of 120 tubes has been installed. Two vertical compound engines, Fig. 5, are direct connected to six-pole 550-volt generators, each having a normal output of 100 k. w. but capable of easily carrying an overload of one-third. The engines are the "Universal" side crank type, having cylinders of 20 and 30 in. in diameter and 12 in. stroke. The engines

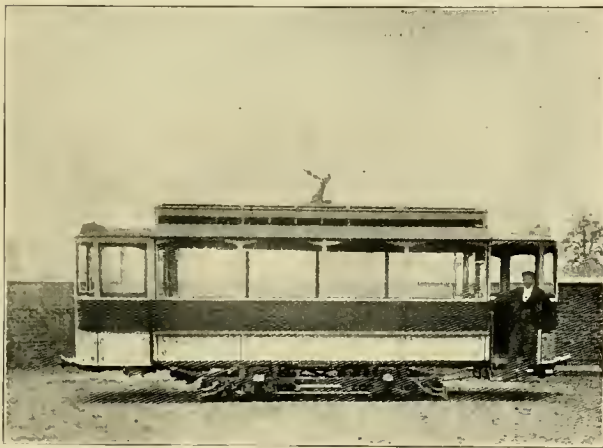


FIG. 6.—CLOSED CAR.

are enclosed by a steel casing but can easily be exposed. One of the principal features claimed for this engine is that the fluctuation of the load does not produce water hammering, the engine being automatically self draining. Steam is admitted only on the under side of the high pressure piston, the high pressure cylinder being drained during the down stroke by a valve, while the draining of the low pressure cylinder is accomplished by the piston exposing a number of holes around the cylinder when at the bottom of its stroke. There are two condensers, an abundant supply of water being furnished from the canal. The switch-board is fitted with General Electric and Weston instruments. The two generators and the two feeder panels have the customary switches, ammeters and circuit breakers. Another panel is provided for recording voltmeter and a total output wattmeter.

There are seven closed cars as illustrated in Fig. 6 and three trail cars, Fig. 7. The motor cars are 27 ft. 6 in. over all and 6 ft. 4 in. wide and have a capacity for 24 passengers. The open cars carry 40 passengers. Each motor car has two 15 h. p., four-pole, iron clad motors with spring sus-

pension. The cars are mounted on Brill trucks. Series-parallel controllers are used. Each car is lighted by ten 16 c. p. incandescent lamps. The car barn occupies a portion of the same building that contains the power station. This

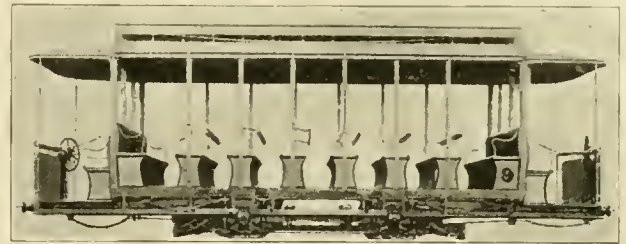


FIG. 7.—OPEN CAR.

road, for a small one, appears to be a model in its way and it is safe to predict that it will be a success for it adheres closely to American practice and the engineers have excluded all novelties based on British theory.

### NEW PHILADELPHIA PARK.

The "Philadelphia Record" thus describes the attractions of Chestnut Hill Park, at the terminus of the Union Traction Company's Germantown line, which was opened for public inspection on May 28, after four months of hard labor and an outlay of \$250,000.

The projectors were not only desirous of securing something just as good in the shape of a pleasure resort as could be found in this vicinity, but they were determined to outdo anything of the kind ever attempted. The cheap trolley ride to the site of Chestnut Hill Park is one which thousands of people have patronized for the past two years. Historic Germantown and beautiful Chestnut Hill, through which the trolley line passes, present sights which are picturesque. The cars land their passengers right in the heart of the park, where the landscaper and mechanic have transformed the once fertile farm land into, it is said, a veritable fairyland. The imposing Casino, which will comfortably seat 5,000 people, in which is situated the huge music shell; the lake, with its pretty electric launches and small rowboats; the scenic railroad; the new style toboggan; the colossal floral display; the dazzling electrical exhibition, and the numerous other attractions are some of the features which will doubtless make this one of the most popular family resorts in eastern United States. In the opening of this resort the management has not neglected a feature which is very essential to every summer resort, and that is its music. Kalitz's concert band of 52 pieces will be a fixture during the entire season, and made its local debut by presenting an appropriate patriotic programme, which included all of the old heart-touching war songs, and several new ones, with powder and colored light embellishments. All trolley lines make direct connections with the Germantown and Chestnut Hill trolley cars.

Miss Amy R. Campbell was on May 19 given a verdict of \$5,000 against the Dayton Traction Company by a jury in the federal court at Cincinnati. The suit was for \$15,000 for personal injuries received in a collision between a trolley she was driving and one of the company's cars.

## DECISION ON DYNAMO REGULATION.

## Victory for Siemens-Halske Company.

An important decision has been given by the United States Circuit Court, of the northern district of New York, in the action brought by the Edison Electric Light Company against the E. G. Bernard Company and others. Basing its action on the Edison patent, of September 19, 1882, the General Electric Company maintained that the claims covered the regulation of dynamos by compound windings. The suit was defended by the Siemens & Halske Company, whose many valuable patents would have been put in jeopardy by an adverse decision. The defense was based on the Brush patent for an improvement in dynamo-electric machines, granted July 22, 1879. The suit has been a very long and expensive one, having been commenced, December 23, 1893, argued February 9, 1898, and finally submitted to this court, March 9, 1898.

The decision of the court in part was:

Although this record has been expanded beyond reason and precedent, it will be noted that the real issue is one of the simplest that can arise in a patent cause, viz., whether the patent is invalidated by a single prior patent?

The best evidence of what the patent covers is the patent itself. It states that it is for "a new and useful improvement in regulating the generative capacity of dynamo-electric machines." The claims are for the dynamo in combination with translating devices in multiple arc; but as this arrangement of translators has been well known since 1875, invention cannot be predicated of this element of the combination; indeed there is no pretense that it can be. If invention can be found at all it must, therefore, be in the dynamo.

The combination of the first claim contains the following elements:

1. A dynamo. 2. Translating devices arranged in multiple arc. 3. Field circuit of constant resistance for primarily energizing the field magnet. 4. Another field circuit whose resistance is varied by the addition and removal of translating devices.

The elements of the other claims are substantially similar, and in view of the conclusion reached it is unnecessary to consider them in detail. Claim 3 differs from the other two, in that the shunt circuit must be supplied from the main conductors.

It will be seen that the first claim is not for a dynamo of the Edison type or for the system of electric lighting adopted by him, but, on the contrary, that it is broad enough to cover, and does cover, any dynamo having the described characteristics in combination with any translators in multiple arc.

The Brush patent relied upon by the defendants was applied for 17 months before, and was granted one month before, the earliest date fixed for the alleged Edison invention.

The Brush patent is for an improvement in dynamo-electric machines and has for its object the maintenance in such machines of a magnetic field while the machine is running, whether the external circuit is closed or open.

Without analyzing the patent in detail, suffice it to say that the description is specific, carefully drawn and clearly illustrated by diagrams. The dynamo of the patent is a compound-wound dynamo having a shunt and series coil, the former of high resistance and the latter of low resistance. In some of the figures the series coil is wound over the shunt coil; in others the shunt is wound over the series, and in another figure the two coils are wound on opposite ends of the same core. The dynamo is designed to generate and maintain a sufficiently constant electromotive force and produce an amount of current always corresponding to the amount needed by the devices in the working circuit. Mr. Brush shows his machine in combination with electroplating in multiple arc, and Mr. Edison shows his in combination with electric lighting in multiple arc. This is the principal distinction between the two. If the one multiple-arc circuit be

the equivalent of the other, then it cannot be denied that every element of the patent in suit is found singly and in analogous congeries in the Brush patent and that they are described there so as to be more readily understood, at least to the uneducated lay mind, than in the Edison patent.

Not only is this clear from the Brush patent, but the proof shows that a number of machines were built pursuant to its directions and were commercially used more than two years prior to the date of the application for the Edison patent. These machines exist at the present day, and what is quite remarkable and almost unique in patent litigation is the fact that, in an art which has progressed with giant strides, machines made nearly 20 years ago are not only operative, but practically as successful as when first built. Two of these working dynamos have been introduced in evidence, one by the complainant and one by the defendants. Each is capable of doing the same work now as in 1880.

The complainant's proposition, if sustained, would lead to the conclusion that Mr. Brush, after having obtained his patent in which the dynamo is described as suitable for an electroplating circuit, could have attached the same dynamo to a well-known lamp circuit and have obtained another patent for that, and so on, as often as he changed the character of the translators.

Even though this work required enlargement, adjustment and some change in the winding, it would still be a question of degree within the realm of the skilled mechanic.

To restrict the Brush patent to electroplating would be as unfair as to restrict Edison's to electric lighting. The one illustrates his dynamo in connection with the first-named translating devices, and the other with the second-named devices.

But even were there more doubt as to the correctness of the conclusion reached, the court should still hesitate to enforce a patent in the sixteenth year of its age, and thus lay the entire art under tribute, when the public has had a right to assume that such a system as the defendants are using would not be molested.

The bill is dismissed.

## NOTES FROM ROCHESTER, N. Y.

In the case of the Rochester Railway Company against the assessors of that city, the referee has rendered a decision in favor of the railway company. The railway company raised strenuous objections to having the capital stock of the company assessed, asserting that as a matter of fact the stock had no actual value at the time, and should not have been put upon the rolls at all. The referee found that the company is entitled to have the assessment upon its capital stock wholly stricken from the rolls.

Beginning May 15 the Rochester Railway Company resumed the sale of tickets at 5 cents straight instead of six for 25 cents, as has been its custom for the past year. Reason for the change is given that the increased usage of the bicycle made an inroad on the company's receipts.

The Rochester Railway Company has perfected a lease of the Irondequoit Company's Summerville line for a period of 10 years from April 15 last, the agreement being dated May 10. The Rochester company will pay the lessor \$8,000 in four installments of \$2,000 each. If the earnings exceed \$20,000 a year the lessor will get 50 per cent.

A verdict of \$300 has been recovered against the Metropolitan Street Railway, of Kansas City, by an employe who was injured by over-exerting himself pulling the "gipsy." The suit was for \$10,000.



**A FINE PIECE OF SPECIAL WORK.**

**A SHYSTER DISBARRED.**

The New York Switch & Crossing Company, of Hoboken, N. J., has recently put in place at the new Franklin avenue car house of the Coney Island & Brooklyn Railroad Company one of the largest pieces of special work ever built. There are 16 curves leading to the car house tracks, but as will be seen from the illustration the main track is practically continuous, there being only one switch tapping it. This switch leads to auxiliary rails parallel to the main track rails and 5¼ in. gage to gage, from them, and from the

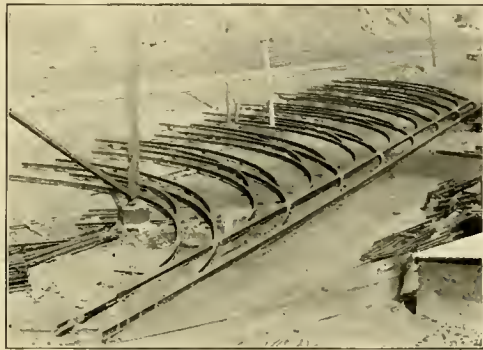
The "Philadelphia Evening Telegraph" published in full the opinion of the Court of Common Pleas, No. 4, in the proceeding to disbar Samuel Evans Maires, brought by the censors of the Law Association of Philadelphia, and we take from it a few short extracts.

Maires was the attorney of Hesta V. Cook in a damage suit against the People's Traction Company and the Philadelphia Traction Company, in which a verdict for \$8,000 was secured against the latter company. In some proceedings in the Orphan's Court between the mother of Mrs. Cook (the plaintiff having died) and the administrator of her estate, an agreement between Mrs. Henning (the mother of Mrs. Cook) and Maires was made public, under which Maires would get \$7,000 of the \$8,000 when collected.

This agreement amazed the agent of the Philadelphia Traction Company, and he investigated several other claims against the company, where the claimants had been represented by Maires. In one case it was found that Maires had collected \$400, lied to his client and settled with him for \$75. In another one, he collected \$500 from the company, told his client he got but \$250 and settled with him for \$125. In another the company paid \$200 and the client got \$50. In another he collected \$100 and paid the client \$20. In one of two other cases where the company paid \$250 the client got \$75, and in the other \$100. In another Maires got \$75 and the client \$25. In all of these the settlement with the client was secured by telling that the company would only pay a much smaller amount than he had collected.

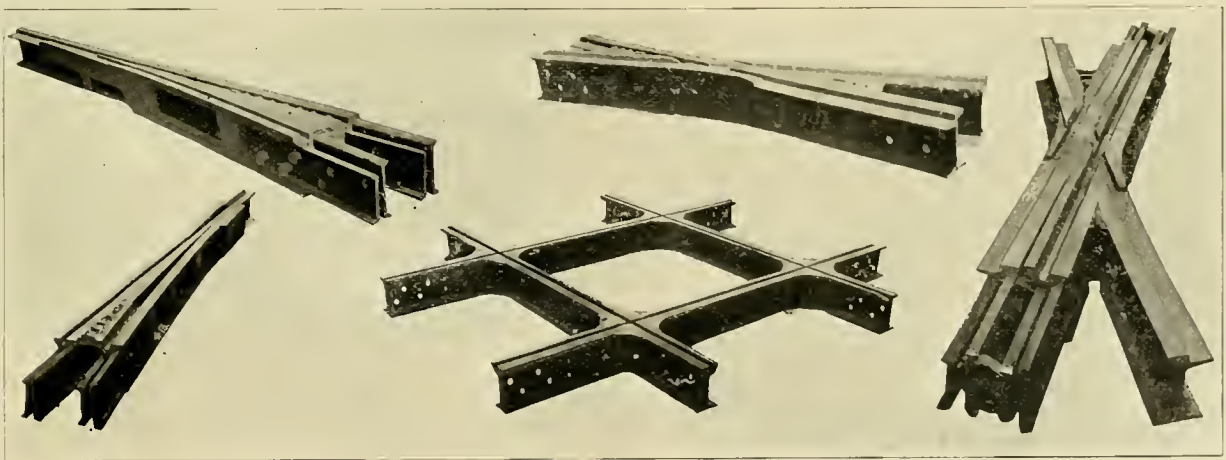
The court says in part:

Mr. Maires' construction of the agreement in all these cases is best given in his own cross-examination. He said that under the irrevocable power of attorney he had an equitable assignment of the claim, of so much of the fund as might be obtained; that he had an interest which under the power of attorney and agreement gave him the right to say whether the case should be settled or not; that when his clients wanted to make a settlement he considered it a breach of the agreement with him;



GENERAL VIEW.

auxiliary track the curves branch off, as shown in the illustration. The main and auxiliary rails are firmly bolted together at intervals of 4 ft. with cast iron spacing blocks. This piece of work is all of 9-in. girder rails with chrome steel centers bound together with cast iron. In order to keep the main track unbroken the frogs crossing it are elevated on the curves so that the wheels can clear the main rail. It is the intention of the company to extend this system of curves by the addition of six more, and provision for



CROSSING, FROGS AND SWITCHES, NEW YORK SWITCH & CROSSING CO.

this extension was made by the builders so that the new curves may be put down without disturbing any of the work now in place. The illustration shows the type of double frog for crossing the main and auxiliary tracks, the switches, etc., used in this work.

in fact that he was a part owner and had a right to control the disposition of the case. \* \* \* \* \*

If we take Mr. Maires' construction of his agreements to be correct, and that he had an interest in the various claims entrusted to him, then he was a partner with the plaintiffs, and in his subsequent dealings with them has been guilty of the modern

statutory offense of fraudulently converting partnership money. Either way we look upon his dealing, as a champertor, barretor, or dishonest partner, we find no mitigation whatever, no excuse for his conduct.

The cases brought to our attention have given positive proof of that which is frequently heard in ordinary conversation, that there are lawyers who make it a business to hunt up litigation and take cases upon speculation, with the usual result, quarrels with their clients based upon a dishonest and unfair division of the moneys recovered. No lawyer with a proper sense of the dignity of the profession, as well as his own self-respect as a man, will stoop to such practices as have been laid bare in the present proceeding. Not even death can keep these ghouls of society at bay; their emissaries invade the house of mourning; they enter the hospitals; no place is sacred from their intrusion. If any more such exist, it is hoped that the board of censors of the Law Association will continue their laudable efforts until the offender shall be discovered and driven out of the profession.

The assistant or runner who hunts up these cases is a nuisance which should be abated. He participates in the spoils, his share being covered up in the items for investigating, working up cases, and doing detective work. Perhaps these runners manufacture testimony, for in at least one of the cases exposed before us the charge for witness fees is greater than the amount paid to the only witnesses known to the plaintiff. From the number of cases of this kind in which Mr. Maires appears we are led to believe that much of his business was obtained in this improper way.

Some criticism was made upon the action of the Philadelphia Traction Company, Mr. Brown, the counsel for Mrs. Heming, and the censors of the Law Association. In reply thereto it should be said, as it is due to them to say, that their action in this matter has been highly commendable, although exceedingly disagreeable and wearisome. The censors of the Law Association occupied many months in the preliminary inquiry before applying for the present rule. They gave Mr. Maires notice of their meetings, so that he was present, by himself and counsel, and knew everything which was being testified. He was not taken unawares nor by surprise. Nor was anything alleged against him here in court of which he did not have previous and full notice so that he could be prepared to meet the charges.

Upon the facts as developed before us, we are constrained to say that Mr. Maires is unfit to be continued longer as a member of the bar of this court, and that an order will be made striking his name from the roll thereof. A certified copy of this order will be sent to the Courts of Common Pleas, the Orphans' Court, and the Court of Oyer and Terminer and Quarter Sessions of this county.

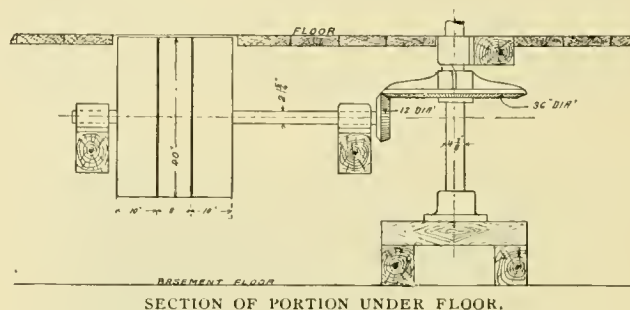
### RAIL BENDING MACHINE.

The rail bending machine shown in the half tone is in successful operation in the repair shops of the Chicago City Railway Company. It is the design of C. E. Moore and was built entirely in the shops. There are three standard sizes of rails in service and no part of the repair or construction work was more tedious and laborious than bending rails for curves, but this machine has made it a very easy and simple operation.

In the line drawing the jack shaft, gearing and foundation of the machine are represented. The two outer of the three pulleys to the left are loose, but the middle pulley is keyed to the shaft. Two belts run from the shop shafting, one straight and the other twisted so that by the use of the belt shifters the machine can be run either forward or back. The small bevel gear at the end of the pulley shaft meshes with the gear on the vertical shaft which reduces the speed to one third. Upon the upper end of the vertical shaft is the driving roll of the machine.

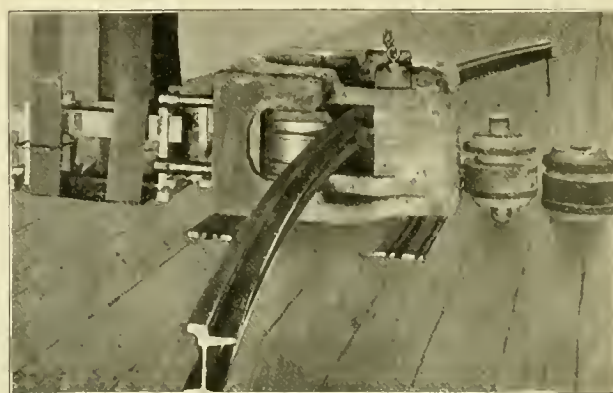
The machine as a whole is quite simple and consists of few parts. The frame is a box shaped casting weighing 7,200 lbs. and has bearings for three rolls. The driving

roll has already been mentioned and the other two are idlers, and the three are located with reference to each other at the angles of an isosceles triangle. The driving roll is keyed to the vertical shaft, the upper bearing of which is in a cap which is bolted to the frame of the machine. When the rolls are to be changed the nuts are removed, the cap lifted off and the roll taken from the shaft and another



keyed on. The two idler rolls have bearings in two jaws which are moved horizontally in guides with the frame. For the adjustment of each of the jaws there are two 3-in. square threaded screws. Each screw turns in a large brass nut which is a bushing through the frame casting. Any desired curve can be obtained by adjusting the position of these two idle rolls with reference to the driver or fixed roll. The shaft for each idle roll has only a half bearing and can be easily removed by pushing the jaw to the inner end of the guide and removing a pin.

With the jaws fixed in one position the rail will pass through and be an arc of a true circle, but by adjusting and running the rail forward and back any desired curve can be obtained. A compound curve cannot be made without the substitution of another set of rolls, but there is no occasion for such a curve in track work. The two rolls at the right in the picture are for a different sized rail from those in the



RAIL BENDING ROLLS.

machine. The rolls are made of cast iron and are turned up to fit the outline of the rail. The whole machine is pivoted on the vertical or driving shaft as this was made necessary to avoid the posts supporting the second floor of the shop when 60-ft. rails are being rolled. A rail which is being rolled makes a speed of 40 ft. a minute. The whole machine complete weighs about five tons.

To support the rail while it is passing through the rolls, trucks, each having a single pivoted wheel, will be clamped to each end of the rail.



## WATER POWER PLANT AT KIOTO, JAPAN.

Japan was opened to western influence very largely through the treaty with the United States which was negotiated by Commodore Perry in 1854. Since that time, and particularly in the last 30 years, the country has developed in a manner which is without parallel in history. Two years ago she engaged in a war and it was conducted upon principles imbibed from European intercourse; in this war she was victorious and there is as a result a new power in the Pacific which in the future must be reckoned with. This is not true in a military and naval sense only, but in the commercial field also are the western peoples beginning to feel the results of that foresighted policy which has for the last quarter of a century sent the young men of the country to England and America to be educated.

Among the many excellent things which the island country has adopted, by no means the least is electricity. The earliest electric lighting plant, an Edison plant, was installed in 1888 in the palace of the Mikado at Tokio. It is by means of electricity that the value of one of the most remarkable feats of modern engineering was measurably enhanced, and the inhabitants of Kioto, the former sacred city of the Mikado, now read their daily newspapers, by the light of the incandescent and arc lamps and ride through its streets on trolley cars.

The operation of a system of electric street railways in Kioto, is the culmination of the great engineering work just referred to—the utilization of the waters of Lake Biwa. This work has excited the interest of engineers the world over.

Lake Biwa, with a superficial area of 500 square miles in the shape of the Japanese harp—"Biwa"—lies some 6 miles from Kioto, beyond two ranges of hills, the larger known as the Nagarayama, the smaller as Hi-no-oka-ama. Through Kioto runs a water way, known as the Kamogawa, by which boats can pass through the city to tide water at Osaka bay. Lake Biwa lies 150 ft. above Kamogawa and the junction of the two seemed so naturally destined that so far back as the twelfth century projects for bringing the upper waters to the lower were presented; but not until the conservatism of old Japan with its duplicate emperors and its feudal system were abolished could the project receive that consideration which the necessity of assimilating European ideas compelled.

In 1882, 11 years only after the abolition of feudalism, S. Tanabe, a student in the engineering section of the Imperial University, selected as the subject of his graduating thesis the construction of canals joining Lake Biwa to Kioto. The subject was very thoroughly treated—the depth of the canal was laid out sufficient to float the boats on Biwa and fall sufficient to allow of the utilization of the water at Kioto for power, as well as for irrigation, fire and sanitary purposes. This thesis excited the attention of the Government. The proposal came at a very opportune moment, and the work was undertaken in 1885 and carried out on the lines laid down by Mr. Tanabe. It was concluded in 1890.

The canal has a total length of  $6\frac{7}{8}$  miles and is divided into two sections. The longer is  $5\frac{1}{4}$  miles long, and carries the waters of Biwa through the hills to the suburbs of the town. The shorter one connects the suburbs to the

center of the city where it connects with the Kamogawa waterway.

The first part of the canal runs from the Lake to the Nagarayama hills, a distance of 600 yds. Through these it passes in a tunnel 12,680 yds. long, and continues in the open another 4,837 yds. to the Hi-no-oka-ama. Through this range it passes in tunnels 137 yds. and 934 yds., respectively, until it reaches the head of the incline.

The constant flow in the canal, available for power and irrigation is 300 cu. ft. of water per second, of which 250 cu. ft. is devoted to power purposes, while the remainder is diverted into another canal for irrigation purposes.

Between the canals is a difference in level of 150 ft. As first laid out locks were to be employed, but this plan was changed and an inclined plane railroad substituted. This is 1,800 ft. long with a gradient of 1 in 15. This railroad is operated by means of a cable having a cradle car at each end. When a boat is to be sent down from Biwa to Kamo-



ELECTRIC CAR IN KIOTO, JAPAN.

gawa, it is slid on the cradle and dropped down to the lower canal. Here it is poled off and the cradle car is then ready to receive another boat for elevation to the upper canal and the waters of the lake. When the cars are started, i.e., one from the lower canal and the other up the short reverse incline at the top, the 50 h. p. motor operating the cable is fully loaded but when the car reaches the main incline the boats are balanced and the load on the motor reduced to 5 h. p.

At the time the canal was projected the possibility of utilizing the power which the difference in level would give, was confined to the employment of water wheels. Before the conclusion of the work, however, the experiments in power transmission by electricity made in America and Europe had aroused attention in Japan, and the use of electricity was decided upon if the reports of Messrs. Tanabe and Takagi, who were sent over to study the question, should turn out satisfactory. The report proving favorable, very complete electrical equipment was ordered from America. This water power electrical transmission completed in 1891, was not only the first in Japan, but also one of the first of the notable ones in the world.

The pipe line consists of three pipes each  $35\frac{1}{2}$  in. in diameter and 1,376 ft. long. The power house is not placed at the foot of the incline, but some 400 ft. from the bottom, in a large pit excavated for the purpose. The water wheels are of Pelton manufacture, and there are now 20 in the station, placed in rows on each side of the tail race, which runs through the center. These wheels are of 120 h. p. each under a head of 100 ft., and are 8 ft. in diameter. They are controlled by ball governors and deflecting Pelton nozzles. In addition to the 2,400 h. p. in the Pelton wheels, 600 h. p. more is available in the length of Kamogawa. This has five locks at each of which a 120-h. p. turbine will be located, when the demand for power warrants the extension.

The station is built in steps, the wheels occupying the lowermost, the countershafts the intermediate ones and the dynamos the top. The wheels are belted to the countershafts and these in turn are belted to the generators.

The electrical equipment, first started in July 1891, with two Edison 80-k. w., 500-volt machines, now consists of a number of generators giving current as follows: 435 k. w. direct current at 500 volts. 250 k. w. single-phase alternating current at 1,000 and 2,000 volts. 240 k. w. two-phase alternating current at 2,000 volts. 240 k. w. three-phase alternating current at 2,000 volts.

The Kioto Canal Power Company, or the Sui-Ri-Jini-usho, operates the power transmission and distribution. Previous to the completion of the work the Kioto Electric Light Company had started a three wire electric lighting installation, with four Edison dynamos. The authorities have decided that the Power Company should control the distribution of the current for power purposes, and the Electric Light Company that for lighting purposes, the former arranged to install the single phase alternators in its station.

The canal Power Company is now furnishing current to 1,000 h. p. in motors operating cotton mills, etc., and is engaged on the installation of some 700 h. p. additional. Its latest development is the establishment of an electric street railway system in Kioto. This is a trolley system on purely American lines. The service is carried out by 26 cars, each equipped with two G. E. 800 motors, and K2 controllers. The overhead system is carried in places on span wires, in others on brackets. The rails are of American manufacture bonded with Chicago rail bonds.

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### IMPROVED PORTLAND CEMENT.

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At a recent meeting of the Western Society of Engineers, John W. Dickinson read a paper upon "Improved Portland Cement," of which the following is a short abstract.

A perfect Portland cement is a product consisting of an intimate mixture of lime and clay-bearing materials, with the elements in exact and perfect proportions and free from any deleterious or even adulterating substances, all burned to a perfect clinker and the clinker ground to an absolute flour. Should the raw materials, even if of perfect composition, not be in a finely divided state or not intimately mixed, the chemical union of the different elements which should be accomplished by heat, is impossible, and the resulting product is simply calcined clay or calcined lime and not unground Portland cement as it should be, and it would

be immaterial how finely such so-called clinker was ground, it could never be Portland cement.

Marked improvement has been made in the last few years in the preparation of the raw materials. Instead of going to the kilns in a coarse, unmixed condition and with the different elements varying from 3 to 5 per cent as was the former practice, and unfortunately is today in many mills, such precision is used in the best mills, that the raw materials are brought to a condition approaching impalpability, then thoroughly mixed and by the use of improved methods and competent supervision, the proportion of the chemical elements, viz.: lime, silica and alumina, are so controlled that the variation never exceeds  $\frac{1}{2}$  of 1 per cent. Great advance has also been made in burning. Bear in mind that the lime and silica in a Portland cement must all be chemically combined by heat, and to effect this combination, a great heat is necessary when the fluxing elements, alumina and iron, are kept at their proper minimum, and no product of the kilns that has not been thoroughly cindered and consequently chemically combined should be used with the clinker making the finished cement, and it is safe to state that owing to the improved process of burning adopted in the past few years, the proportion of underburnt material coming from the kilns has been reduced from 25 per cent to 30 per cent, to less than 5 per cent, and in some cases the product of the kilns is invariably perfect clinker. The higher the percentage of combined lime the stronger the cement, and owing to the improved methods employed both in preparation of raw material and in burning, the lime has been increased from about 55 per cent of the total to an average of 60 per cent, and in a few cases the entire process is so perfect that 65 per cent of lime is successfully incorporated.

But it is probably in the matter of grinding that the greatest advance has been made. Perfect clinker is sufficiently hard to scratch glass, and it is evident to anyone that will take two pieces of clinker, say the size of large diamonds, and wet the surfaces, that on putting them together no bond will result. Now, if we break up one of these pieces and attempt to cement together even the smaller particles, we find that these are no more cement than the larger pieces. By taking the residue on the 50—100 and 200 sieve, it will be found that the so-called cement represented by such residue is equally inert. Some investigators have reported slight strengths from the residue obtained by taking the intermediate of the 150 and 200 sieve, but I am positive that the strength thus obtained was wholly owing to the cement flour that adhered as dust to the coarse particles.

By improved grinding machinery 85 per cent of flour is secured, instead of only 60 per cent, as was the case 10 years ago. As adobe was superceded by lime, lime by natural cement, natural cement by Portland, so have the coarsely ground bicalcic-silicate Portlands of 10 years ago been practically supplanted by the fine-ground tricalcic-silicate cements.

Cement work suffers more from careless and mischievous attacks during the first month than in any future twelve, so the quicker a cement sidewalk, floor, or foundation is hard and out of danger of attack from any source, the better, and it has been the aim of the American manufacturer to produce a cement that will get its maximum strength in the shortest possible time.



Data were submitted showing the relative strength of an American and of imported Portland cements as determined by several engineers, and they showed in every case the marked superiority of the former.

In the lines of improvement mentioned, viz.:

1. Better preparation and more accurate mixing of the raw materials.
2. Uniform and complete incineration.
3. By fine grinding.

This country has taken the foremost position, equalling at least in the first particular any other country and in the second and third easily leading the world.

In the discussion a number of points were brought out.

The boiling test is the most accurate in determining soundness and stability. Any cement that will remain intact in boiling water for eight or ten hours is permanent, and there is not the slightest possibility of any cement standing this test ever showing any but the fluctuations in test due to climatic and other conditions, even as natural rock, which must be presumed to have attained the maximum strength, varies at different times.

In the present specifications, of architects at least, the requirements are based upon the kind of cement used 10 or 20 years ago, when concrete made of, say, one part cement, three parts sand, and three of crushed stone was satisfactory. With the better grades of German and American Portlands, it is believed that one part cement and four or five parts sand, and four or five parts of crushed stone to one of mortar is sufficient.

Reference was made to the slag cements and some instances of their use in foundation and wall work under trying conditions and with satisfactory results.

### TUNNEL EXCAVATING MACHINE.

The work of constructing the tunnels of the London Central Railway, which are now nearing completion, has been materially advanced by the use of an excavating machine, especially designed for the purpose. The rotary cutters failed in hard clay soils containing chalk and large stones, and a new cutter was constructed by the contractors, Walter Scott & Co., and described in "Engineering" of London.

It was essential that the machine be able to excavate

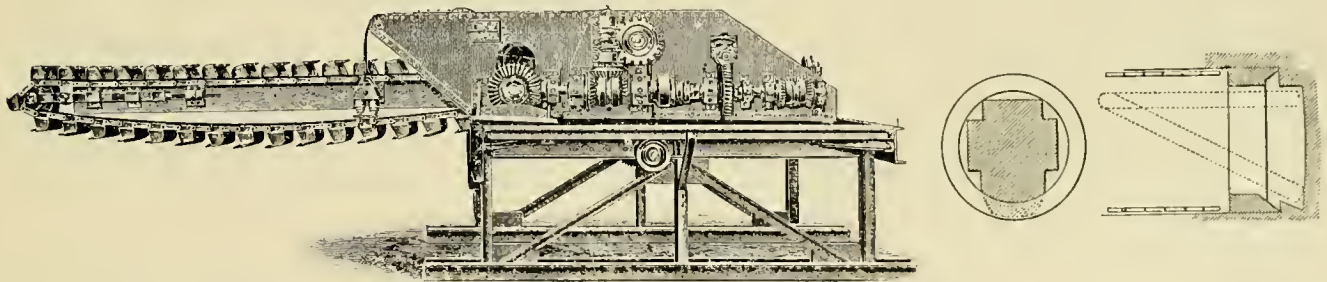
can be withdrawn so that hand work can at once be resumed whenever conditions demand it; and it must be so constructed that the direction of the shield can be controlled and the lines and bevels conveniently checked.

A side view of the machine is here given. It runs on a track 6 ft. 3 in. gage with an opening beneath it 5 ft. 8 in. high, sufficiently large to admit the small cars used in conveying the earth to the surface. A 25-h. p. motor is mounted at the back end of the carriage and connected to the shafting by a worm and gear, driving the endless chain, raising and lowering the cutters and propelling the carriage. As the excavating buckets run at a comparatively high rate of speed, especial care has to be given to the feed. All the levers and wheels for the control of the machine are within easy reach of the operator, who stands on a small platform at the side of the machine. The bucket ladder is fitted with a screw extension device for tightening up the bucket chain. The buckets are really scrapers and each has four or five teeth, placed alternately, chisel-shaped and fitting into recesses cast in the back of the buckets. Cast steel was first used in these buckets, but as one or two were broken, gun-metal has since been employed with better results.

In operation, the excavator is brought up to the face and scrapes out all that it can reach in a space 18 to 24 in. beyond the front of the shield; the area covered being shown in the accompanying diagram. The machine is then run back 10 or 12 ft. clear of the face and the shield is pumped forward, the cutting-edge bringing down the earth not touched by the excavator. This insures a clean cut and no cavities. The iron lining is next erected and bolted up and the excavator is again set to work. While the machine is not as large or heavy as experience shows would be desirable, the only stoppages have been due to the breaking of buckets. As it is, the saving over hand-labor is very considerable, and an average advance of three 20-in. rings is made in 10 hours, with eight men at the face, including the machine operator.

### A PECULIAR ACCIDENT.

May 26 a workman on the South Side Elevated, Chicago, dropped a tool which made electrical connection between the third rail and a large gas pipe carried on the structure. A hole was burned in the pipe and the gas ignited. The fire department was called out and traffic between the downtown terminus and 33d street was blocked for over two



TUNNEL EXCAVATING MACHINE, LONDON CENTRAL RAILWAY.

through beds of hard clay, chalk formation and not be damaged by large boulders; the earth must be delivered at a height sufficient to drop it into cars; it must not form an obstacle to any other tunneling processes, and such that it

hours. The wiring in several cars was burned out and the cars set on fire. A few days previous to this another one of the cars was set on fire by arcing in a portion of the electrical equipment.



# ACCOUNTANTS' DEPARTMENT

Chairman C. N. Duffy, of the permanent committee of the Accountants' Association on "A Standard System of Accounts," together with his associate members are steadily working on their big undertaking. In order to secure additional data to work on and guide the committee, the following letter is issued which deserves not only the careful study of every manager and accountant, but a prompt and full response. The deluge of demands upon the time and attention of officials often leads them to neglect appeals of this kind, with which they fully intended to comply, and it is urged that the importance of this work deserves an immediate and special recognition. The committee is exceptionally strong and well qualified for the task they have consented to assume, and were it simply a matter of personal compensation we know no one of them would undertake it for anything short of a very large amount. As a matter of fact the street railway interests of the country could well afford to pay \$10,000 rather than not have this work done. The several gentlemen, however, are freely giving their time and labor and experience without any hope of personal remuneration, and purely for the general good to all. Hence we repeat, the appeal of the committee, not for money, but for a little information, deserves the unqualified assistance of every road, for every company in the country will be benefited by the results. The letter referred to is as follows:

St. Louis, May 20, 1898.

Dear Sir: The permanent committee of the Street Railway Accountants' Association of America, on "A Standard System of Accounts" begs leave to acknowledge the receipt of your reply to the circular postal card of W. B. Brockway, secretary, sent out Jan. 15, 1898, relative to the adoption of the standard system of accounting, as recommended by the association at the convention held in Niagara Falls, N. Y., October 19-22, 1897, which reply was forwarded to the committee by Secretary Brockway for the use of the committee.

From the 31 replies received by Secretary Brockway, it would appear that the standard system as recommended by the Niagara convention is, in the main, satisfactory, and in its general features very closely conforms to the system used by the different street railway companies, which are members of the Accountants' Association. This, together with the fact that a number of street railway companies, some of them the largest in the country, put the standard system as recommended by the Accountants' Association into practical operation, on January 1, 1898, and have found it practical, and in the main satisfactory, although there is room for improvement in many of the minor details, may be regarded as a cause for congratulation by the Accountants' Association, and is the first practical step taken to have a standard system of street railway accounting adopted and used.

Some of the members were good enough to point out objections to the standard system, giving their objections in detail and their reasons for the same, together with some

ideas and suggestions of their own. This is the kind of criticism and assistance that the committee stands most in need of. With that end in view, we call upon you to co-operate with the committee and give us the benefit of your ideas and experience, with such criticism as you may see fit to make, as it is our ambition to do all in our power to perfect the standard system recommended by the Accountants' Association, secure its adoption and use by every member of the association, and have it endorsed and approved by the officials of every state in the United States who exercise any supervision over the books and accounts of street railway companies in their respective states.

Will you kindly assist the committee by replying to the following questions, so that we may have your reply on or before July 1, 1898:

1. Has your company adopted the standard system of accounts?
2. Has your company found the standard system practical and satisfactory?
3. Has your company found objections to the standard system; if so, please state them in detail.
4. What suggestions can you offer or what criticisms can you make to perfect the standard system?
5. On what date did your company put the standard system into operation?
6. On what date does the fiscal year of your company close?
7. Do the state officials of your state exercise any supervision over the books and accounts of your company?
8. If your company has not adopted the standard system, has the matter been considered at all?

Your prompt reply will be gratefully appreciated by the committee and will materially aid it in the work.

Very respectfully,

C. N. DUFFY,  
WM. F. HAM,  
J. F. CALDERWOOD,  
H. L. WILSON,  
H. J. DAVIES,

Committee.

Please address all communications to C. N. Duffy, 3820 Easton avenue, St. Louis.

Mr. Duffy advises us further that Henry F. Billings, chief clerk to the Railroad Commissioners of Connecticut, has signified to Elmer H. White, of the Hartford Street Railway, that he will be present at the next meeting of the Committee.

Two verdicts, one for \$5,000 and one for \$8,000, were recently recovered against the South Covington & Cincinnati Street Railway Company in one week.

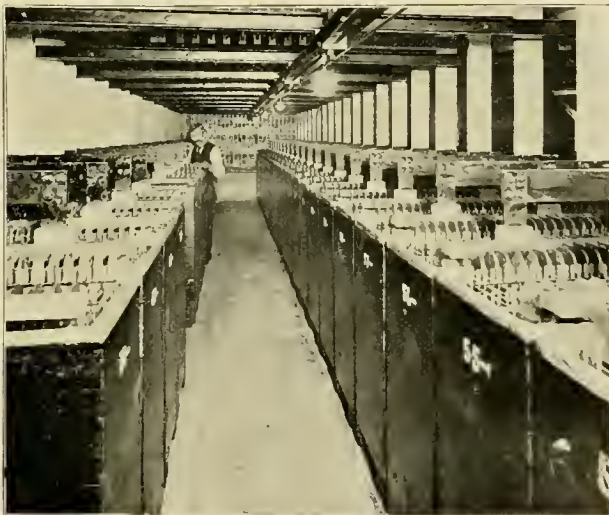
A Brooklyn motorman fainted when he ran his car over what he thought was a man on the track, which proved to be a dummy of straw.



## THE LARGEST STORAGE BATTERY INSTALLATION.

The conditions governing the installation of a storage battery in a central station are similar whether the current be used for lighting, power or street railway purposes. The functions of the battery are that it shall be a voltage regulator and act as a reservoir giving an economic load for the generating machinery and returning the energy to the circuit when most needed. A problem presented itself to the Chicago Edison Company, which has demanded the attention of many street railway managers, viz., at a certain time in the day there was a peak in the load requiring more current than could be efficiently generated at the stations. The alternative lay between the addition of more engines and dynamos or a storage battery.

In the winter time the peak of the load comes on about 4:45 p. m. lasting from  $\frac{3}{4}$  to  $1\frac{1}{4}$  hours and being 12,000 amperes above the normal load. This maximum in the downtown district increased from 36,000 amperes in 1896 to 44,000 amperes in 1897 and will reach 55,000 amperes this coming winter. The arrangement of the stations and the distributing system was very favorable to the installation of a battery, both financially and from the standpoint of its effectiveness. The battery installed is the largest in the world, and has a capacity of 22,400 ampere-hours at an 8 hour rate and will be able to discharge 11,000 amperes for about  $1\frac{1}{4}$  hours. It consists of 166 cells, 60 of which are end cells, 83 on each side of the three wire system. This large number of end cells is required to meet the wide conditions of pressure. The battery is called upon to deliver 140 volts on each side at the end of discharge and in case of an emergency to deliver current at the maximum of 120 volts on each side when fully charged. Each cell contains



END CELLS IN BATTERY ROOM.

87 plates, type "H" made by the Electric Storage Battery Company, of Philadelphia. The positive plates are of the standard Manchester type and are  $15\frac{1}{2}$  by 32 in. Each tank is  $21\frac{1}{2}$  in. wide by  $79\frac{3}{4}$  in. long by  $43\frac{7}{8}$  in. high and weighs 6,200 lbs. The total weight of the battery exclusive of conductors is 1,029,200 lbs. The tanks are constructed of 2 in. ash lined with 5-lb. sheet lead. Each tank is sup-

ported on 10 double petticoat insulators resting on tiles laid on the acid proof floor.

The current is carried from the Harrison street station to 139 Adams street, the site of the original plant, over a trunk line 3,500 ft. in length and then distributed. The old Adams street site was therefore a very favorable point for a battery installation, since a large trunk line investment



REAR PORTION OF BATTERY ROOM.

was avoided. Moreover, the center of load of the system has been gradually moving farther away from 139 Adams street, so that for good regulation at time of maximum load in winter with feeders varying from 800 to 3,000 ft. in length, either a booster system or a large outlay in copper had to be considered. The battery is located in the basement of the office building of the company at 139 Adams street. Precautions were taken to see if the footings of the columns supporting the floors above would be sufficient to sustain the weight of a duplicate installation in the future. New footings were necessary and the building temporarily was shored up. The question of permanency in every detail was the first consideration as the size of the installation and the limited area and head room made alterations in the future out of the question.

The matter of sub-drainage, surface drainage, supports for the cells, as the building is not piled and is on soft ground, the floor and protection of the columns and iron beams supporting the upper floors of the building and the ventilation, were most carefully investigated. A sub-drainage system of 3-in. tile pipes laid in concrete was installed and surface drainage lead pipe laid in sand draining several lead lined sumps and both draining into a large sump at the extreme south end of the room, which is emptied by a lead lined centrifugal pump and discharged to the sewer.

To prevent settling five 4-in. 1 beams were laid crosswise under the cells, the space between being filled with concrete. Over this a few courses of tarred felt were laid.

The floor is of vitrified shale tile, 10x11x2 in. laid in a mixture of 70 per cent of asphalt and 30 per cent of coal tar. The bottoms of the columns are encased in lead. The columns were carefully cleaned, then treated with a galvanic varnish and afterwards encased in wire lathing and covered with an alkaline cement plaster and then covered with a

coating of anti-acid paint. All of the walls and ceilings are treated with the same plaster and are rendered impervious to acid fumes.

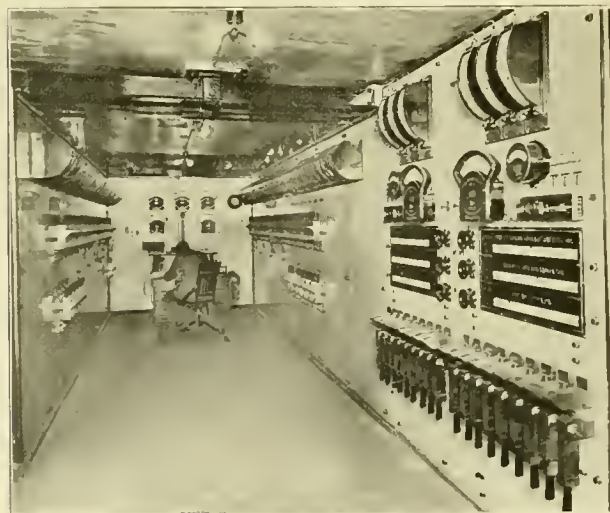
For ventilation two ducts on opposite sides were run the entire length of the room, one for blowing in fresh air, the



VENTILATING DUCTS IN BATTERY ROOM.

other for exhausting. This affords several cross currents of air and effectually removes the gases which are conveyed to the roof and blown to the outer air.

The end cells are connected to the end cell switches by lead covered copper bars  $6 \times \frac{1}{2}$  in., supported by insulators resting on iron girders strung between the columns of the building. The main connection of the battery consists of two copper conductors giving a sectional area of 6 sq. in. The lead coating of the copper is a special feature which



FEEDER AND STORAGE BATTERY SWITCHBOARDS.

renders the copper impervious to the action of the acid and gases.

There are three end cell switches on each side of the system. These switches have 30 points and are capable of carrying 2,750 amperes each. The connection between the

30 contacts and the bus bar of the switch is made by a laminated copper brush travelling on a screw operated by a  $\frac{1}{2}$ -h. p. series motor. These motors are put into operation by push buttons on the controlling switchboard, but are stopped automatically when the brush reaches the mid point on the contact block by an automatic device which breaks the motor circuit and short circuits the armature. The method insures the positive action of the end cell switch without requiring attention of the switchboard operator. These switches are provided with a hand wheel for hand operation if desired. The gear wheels are provided so that the three switches can be geared together and operated as one switch, thus giving a capacity of 8,250 amperes on each side of the system.

The controlling board is connected to the bus bars of the end cell switches by 12 cables of 1,500,000 c. m. each. On the controlling board there are three single pole switches for each end cell switch enabling it to be connected to either the main, auxiliary or charging buses. Each end cell switch has an indicator on the controlling panel operated mechanically by light shafting and gearing which shows the operator the exact position of the traveling brush on the end cell switch at all times. On each panel of the board there is a 30 point voltmeter switch connected to a low reading voltmeter, which enables the operator to take the voltage of the end cell switches.

One of the important features in connection with the battery installation is the method of charging without the use of boosters, which are ordinarily employed. The method of charging this battery is to operate a pair of 200-k. w. machines in the Harrison street station at about 180 volts, which is the voltage required for charging, and send the current over a portion of the trunk line to the battery station. The voltage regulation of the dynamos being effected by an automatic control of the field resistance by means of small motors, which are controlled by the operator in the battery station at Adams street, small lead covered cables being run from Adams to Harrison street connecting with the motors controlling the field boxes. These generators which are used for charging are not generators specially made for the purpose, but are the same ones which at other periods of the day are used to feed into the main bus bar of the station, thus saving an investment of about \$15,000 in boosters as well as providing a system of charging, which is very much more economical than the one in which boosters are employed.

The battery will be kept in circuit at all times during the day time in summer, keeping the engines at the central station working at the most economical point, the battery being ready at any time to take care of any sudden increase in load which may occur in the system, as well as taking care of the peak in winter time, for which purpose it was primarily purchased. By maintaining the battery on the circuit continuously the necessity for regulation of pressure at the central station is very much lessened.

In a paper before the National Electric Light Association on "General Distribution from Central Stations by Direct Currents," L. A. Ferguson, general superintendent of the Chicago Edison Company, has this to say on the subject of storage batteries:

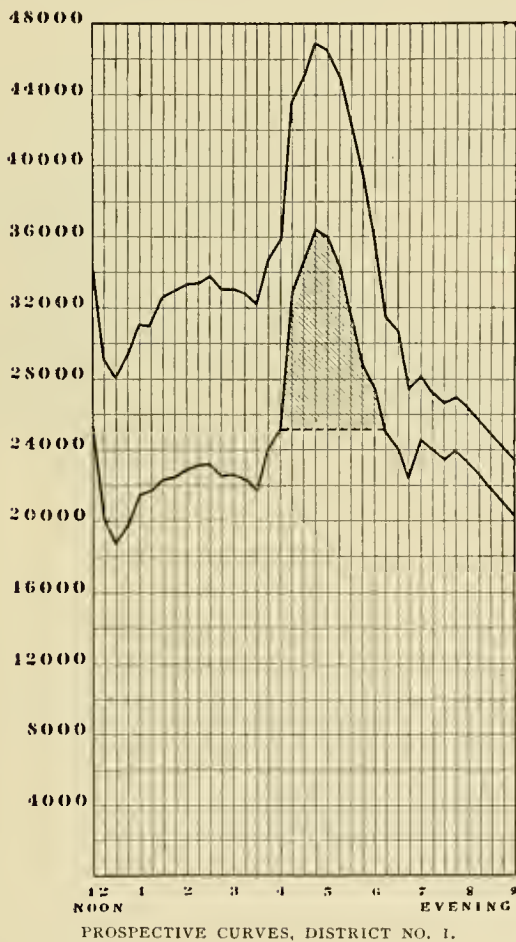
One of the advantages to be derived from the use of direct current distribution as distinct from alternating current dis-



tribution, is the employment of storage batteries. They may be adopted for use in various ways, in sub-stations in outlying districts where the load factor of the district is very small, in the central stations themselves to deliver the entire output during period of minimum load, at the centers of distribution for discharging during the peak, as auxiliaries in rotary transformer sub-stations for discharge use at the time of the maximum load in the main central station. In addition to any one of the various ways which the battery may be employed, it always acts as a reserve, guaranteeing the consumer good service, in much the same manner as a bank surplus is a guaranty to the depositors in cases of financial emergency.

Storage batteries when installed in central stations or centers of distribution are usually connected to the main bus and allowed to float on the system taking a charging current from the bus or discharging into the bus according to the load on the system, the generating units being worked at such load as will insure the best efficiency of the entire system.

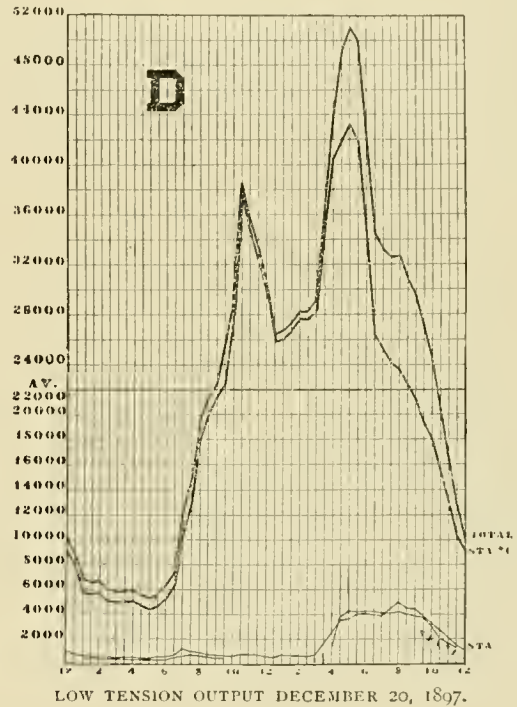
Batteries are economically valuable in connection with the distribution of direct current in systems whose load curve has an average peak width of not more than two hours, since the investment required for storage batteries to carry the peak having an average width of less than two hours is less than the investment required in steam and electrical machinery to do the same work. The storage battery also has the same value that exists in the case of moving machinery as a reserve in meeting sudden increases of load, provided such increase of load does not continue for a sufficient period to wholly discharge the battery and insufficient time remain for recharging before the ordinary



load peak of the system appears at the regularly appointed time. Such a condition is rarely and I might say almost never met with, although in rare instances we may approach this condition.

The steam and electrical machinery is rated by the horse power

or kilowatt, and the duration of the load peak does not influence the value of the investment since the machinery may be operated for the full 24 hours at its maximum capacity. The storage battery, however, is rated by the h. p.-hour or k. w.-hour, and the investment is nearly directly proportional to the number of hours during which it discharges the maximum capacity, so that if we required the battery to be prepared to carry the full peak prolonged for seven or eight hours every day the investment in battery would be enormous as compared with steam and electrical machinery to furnish the same kilowatt hours output. Illustrative of such contingency, let me refer you to the load diagram marked "D," representing the load in the business district of Chicago, December 20, 1897. This is a very extraordinary curve, illustrating the limitation of the storage battery and the possibility of its being rendered ineffective had the early



morning peak extended to the arrival of the regular afternoon peak, without affording sufficient time for recharging the battery.

The storage battery has a very distinct value, which is seldom recognized and employed to its full advantage, when located at the central distributing point of a system with feeders radiating to various points in the net work. The battery may be provided with two or more end cell switches, so arranged that they may be connected in multiple and feed into the main distributing feeder bus, or they may connect also to one or more auxiliary busbars with a different number of cells in series, feeding into each bus thus providing two or more potentials at the center of distribution. It will be found that when only one pressure is maintained at the center of distribution during the time of maximum load of a large district that the pressure at the ends of the short feeders will be somewhat higher than the standard and they will be overloaded, and at the end of long feeders the pressure will be lower and the feeders underloaded, although the pressure variation at other times may be negligible. Under such conditions the storage battery becomes exceedingly valuable, for by arranging it to operate at two or more potentials, the long feeders may be connected during the time of maximum load to the auxiliary bus or buses and additional current forced over them, utilizing their full capacity and maintaining a uniform feeder end pressure by means of an investment in end cells very slight as compared with the investment in additional feeders and mains required to accomplish the same result.

## A NEW UNDERGROUND ROAD IN PARIS.

The Orleans Railroad operates about 4,300 miles of track in the west and southwest parts of France and has its Paris terminal in the extreme eastern part of the city at the Place Valhubert. Inasmuch as the travelling population lives in the opposite part of the city the company wishes to prolong its line some  $2\frac{1}{2}$  miles to the Quai d' Orsay as indicated by the heavy line on the accompanying map. This involves an expenditure of about \$8,000,000.

The new road will have two tracks and will drop from the Vallhubert station on a grade of 1.1 per cent towards the Seine. Here the river banks are in two stories, an upper quay or roadway, and a lower quay used as a dock or wharf for canal boats. A belt 9 meters wide has been secured on this lower quay, and the line will follow this in the open for 650 meters. It will be an underground road beneath the upper quay for the remainder of the distance until it reaches the terminus under the Cour des Comptes. Openings in the wall side of the quay facing the river will afford light and



MAP OF PARIS SHOWING EXTENSION.

ventilation. The rail level is about that of the normal height of the water; any seepage water in times of flood will be gathered in a sump and drained out.

The road follows the line of the Quai's St. Bernard de la Tournelle, de Montebello, St. Michael, des Grands Augustins, de Conti, Malaquais and Voltaire to the Quai d' Orsay, passing the bridges, Ansterlitz, Sully, de la Tournelle, de l' Archeveche, au Double St. Michel, Neuf, des Arts, du Carrousel, Royal, and Solderino. From the Pont Sully to the Petit Pont the underground construction will be a masonry arch nine meters span for a length of about 900 meters. From this point, for another 500 meters, the upper roadway will be carried by a metallic arch and for the balance of the distance the masonry arch construction will be resumed with a span of about 8 meters.

About half way between the Place Valhubert and the Quai d' Orsay, between the Petit Pont and the Pont St. Michel a station will be built, known as the station du Pont St. Michel. The Quai d' Orsay station—the terminal station, will lie between the buildings of the Caisse des Depots et Consignations and the Palais de la Legion d' Honneur and between Pont Royal and the Pont de Solferino. It has been designed by M. Sabouret, chief engineer of the Central

Service. The Orsay station will have fifteen tracks, any one of which can be used for arriving or departing trains. According to the present plans, the three tracks nearest the river will be used for side tracks, the next four tracks for the long distance departing trains, the next two for arriving and departing suburban trains, the next two for arriving long distance trains, the next two for arriving and departing suburban trains and the last two for station service.

It is possible that at a future date the Western Railroad of France and the Belt Railroad of Paris may bring their terminals to the proposed new station and thus unite the three systems.

The present plans are for the operation of this underground road by electricity, making the generating station (which will be at Vallhubert station) of sufficient capacity to move four 200-ton trains.

In order to investigate heavy electric traction as practiced in this country, M. E. Solacroup, assistant chief engineer of material and traction, M. Sabouret, chief engineer of the central service, and Messrs. Liberty, Fernenville and Walton, made a tour of inspection, visiting New York, Chicago, Baltimore, Cleveland, Niagara Falls, Buffalo, Boston, Schenectady and other cities. At Schenectady the General Electric Company arranged a special test on its experimental track. A motor car of the Nantasket Beach pattern, equipped with four G. E. 55-175-h p. motors hauling a train which with the motor car weighed 320 tons was used.

The question of rendering the third rail innocuous after the passage of the train having been brought up, the General Electric Company arranged an exhibition of its method of effecting this result. A section of the third rail was measured off and divided into sections in lengths varying from 30 ft. to 500 ft. Connections were made between these and a system of automatic switches, and the conditions of the General Electric system of surface contact, almost exactly reproduced. By this system, the arrangement of circuits is such that the sections into which the rail is divided may be of any length from that of a few feet to any number of miles, that is any section of the conductor rail will be alive only when the train itself is running over that section. Pilot lamps were used as a visual means of indicating which sections were alive.

Before the French engineers left New York a banquet was tendered them at Delmonico's.

## DECORATION DAY IN ITHACA, N. Y.

On Decoration Day the Ithaca Street Railway Company provided an elaborate and varied entertainment at its Renwick Beach Park on Lake Cayuga, which proved to be a great success. The program included:

- 11 a. m.—Cornell crew in practice.
- 2 p. m.—Variety performance in pavilion.
- 3 p. m.—Balloon ascension; thrilling parachute drop of one mile.
- 4 p. m.—Great war pictures; comedy; music.
- 4 p. m.—Base ball game on Percy Field; Cornell vs. Columbia.
- 7:30 p. m.—Ithaca Band, selected music.
- 8 p. m.—Performance, war pictures, etc.
- 8:30 p. m.—Fireworks; elaborate display, special set pieces, etc.

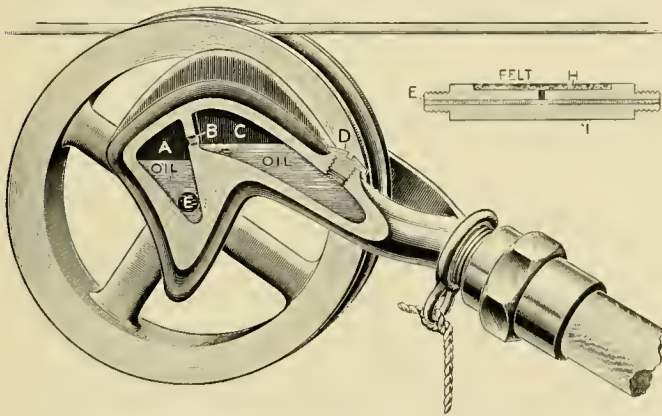


## AN INTERESTING SOUVENIR.

Benjamin J. Weeks, superintendent of the Quincy & Boston Street Railway Company, has sent to the REVIEW a polished granite disk some  $3\frac{1}{2}$  in. in diameter and  $\frac{3}{8}$  in. thick which was cut from a sleeper used in the construction of the first railway built in America, completed October 7, 1826, leading from the granite quarries of Quincy to the Neponset river. At the meeting of the Massachusetts Street Railway Association, held in Quincy in July last, the Quincy & Boston road presented similar blocks to the delegates.

## EXCELSIOR SELF-OILING TROLLEY HARP.

We show in the accompanying illustration an improvement in trolley harps. The manufacturers state that this harp has been adopted by the Rapid Railway Company, the Mt. Clemens Fast Line, and the Sandwich, Windsor & Amherstburg Railway after a trial of 30 days. The former company states that "it was used on one of the fast cars having two 75-h. p. motors geared to 50 miles per hour, and that it ran 7,652 miles with one oiling and showed no wear of any parts." The latter company states that "after 30 days there was enough oil left for another 30 days, that there was a great saving of oil and labor, and no leakage on top of cars."



SELF-OILING TROLLEY HARP.

It would seem from this that this trolley harp would supply a long felt want.

The company also states that it believes, with oil of proper consistency, and with axles  $\frac{3}{4}$  in. to  $7\frac{1}{8}$  in. in diameter, they will run 60 days with one oiling; it considers the axle at present used,  $\frac{1}{2}$  in. in diameter for a 6-in. wheel, too small for the best results. It is prepared to make quotations on harp, wheels and bushings, complete or separately, also to supply harps with larger axles and bushings.

Referring to the cut, each side of harp holds one ounce of oil. C is the main reservoir; A the auxiliary reservoir; D, filler plug; E, feed to axle; H, felt to prevent rapid flow of oil; B, passageway through which oil passes to auxiliary reservoir when trolley is reversed at the end of a trip. After long use the harp can be blown out with steam and cleaned, by simply taking apart and blowing a jet of steam through the filler plug, D. Any further information will be cheerfully given by the maker, the International Specialty Company, 113 7th street, Detroit, Mich.

## TEA-POT FARE COLLECTORS AGAIN.

The Union Street Railway Company, of Saginaw, Mich., George B. Morley and Homer Loring, receivers, has found the "tea-pot" system of collecting fares a source of trouble.

On April 1 the receivers adopted the Mehling fare box system, the operation of which requires the passenger to deposit his own fare in a metal safe carried by the conductor. Some objections were made by passengers to the use of these safes and a number of them refused to deposit the fare in the safe, but tendered it to the conductor. Thereupon the receivers had posted in the cars notices forbidding the conductors to receive fares, and informing passengers that they must deposit their fares in the safe or be ejected from the cars. The refusal of M. C. L. Kitchen to deposit his fare led to his ejection, and he applied to Circuit Judge Wilber, one of the judges of Saginaw county, for leave to sue the receivers for damages.

The petition for such leave alleged that the fare boxes or safes were an unreasonable regulation and that their use ought to be prohibited by the court. After a full hearing, Judge Wilber made an order sustaining the receivers' right to use the fare boxes, holding that they were a reasonable and proper regulation, and dismissed the petition.

The conductors objected to the safes on the ground that they were a reflection upon their honesty, and so distasteful were they to some of them that they persistently refused to collect the fares with them and to ring the number on the register. Conductor John C. Smith, during the time he used the box, persistently refused to register the fares collected, there being an average of 12 per cent difference between the fares in the box and the number registered. He was warned by the receivers that unless he complied with their requirements and operated the box properly he would be discharged. Notwithstanding this warning Smith continued to refuse to ring the fares properly, and the result was that he was laid off for one week without pay.

Smith presented a petition to Judge Snow, the other circuit judge for the county, asking that he be allowed pay for the week he was laid off, and also that the court make an order compelling the receivers to stop the use of the Mehling system and to return to the old overhead register system. Both of these orders were made by the court on May 2, the receivers being directed to return to the overhead register system of collecting fares within 10 days.

The case was taken to the supreme court, it granting an order directing Judge Snow to show cause why his order should not be set aside, and suspending its operation temporarily.

The case is both unique and important, and the decision of the court will determine to what extent the employes and patrons of a street railway company may dictate its management. In this respect it is of interest wherever a street railway system is in operation.

The Wilkesbarre (Pa.) & Wyoming Valley Traction Company has discontinued the sale of books of 100 tickets for \$4, and will hereafter sell 100 loose tickets for \$4.25.

It is stated that Louis Enricht and Paul E. Hirsch, of Chicago, will sue the Cañon City & Cripple Creek Electric Railway for \$200,000 damages, because of their arrest by parties connected with the road.

## RECENT ELECTRIC RAILWAY PATENT DECISIONS.

Two patent cases of importance were decided in May, one was the series-parallel controller case decided May 19 in the United States Circuit Court for the district of Connecticut, and the other the railway motor suspension case decided in the United States Circuit Court of Appeals, second circuit, May 17.

The first of these promises to be far-reaching in its effects. In the early development of electric railroading, it was found advantageous to employ at least two motors upon a car. Various plans of regulation were adopted, some depending upon varying the amount of field magnet winding included in the circuit or changing the mutual relations of a plurality of coils on one field magnet or the relations of two motors bodily; others relying upon the varying of a dead resistance included in the motor circuits. This latter, known as the rheostatic method of control, was very wasteful, since all the energy which was converted into heat in the rheostat was in reality lost and this loss was practically perpetual and also represented a considerable percentage of the total energy of the motor circuit. The method of varying the internal resistance of the motor by varying the connections of the coils avoided in a large measure this waste of energy, but notwithstanding its economical advantages it was not generally adopted because the practical disadvantages involved in frequently changing the relations of the coils during active work more than counterbalanced its economies. Mr. Sprague probably did as much work as any one upon that principle, confining his changes, however, to the field coils; but he finally abandoned it and went back to the old rheostatic method because it was found that changing the connections of the field coils was accompanied by the production of such high induced electro-motive forces and inrushes of current as to break down the insulation of the field-coils and the armature. The cause of this difficulty was not apparent at first and it took some time to find it out. The same high inductive voltage also produced excessive sparks at the brushes and caused other damage to the armature and the switch. Theoretically the advantage of the series parallel method is available only where two motors are used and the controller can take care of the armatures as well as of the field magnets and so effect a change of the motors bodily from series to multiple. Hopkinson in 1881 and Curtis and Crocker in 1882 had proposed to utilize the series parallel principle by connecting the circuits of a motor so as to vary the internal resistance, but so far as known never reduced their ideas to actual operation. Condict supplied the remedy and this may be stated briefly to be the provision that at the time of changing the circuit connections the controlling switch shall act to automatically introduce into the circuit a "dead" auxiliary resistance, and then when the new connection has been effected, shall gradually and automatically cut the resistance out. The function of this resistance is to reduce the current flowing so that at the time of making a change in the motor connections, the current is small compared with what it would be if these resistances were not inserted. This resistance is then gradually cut out of circuit.

The fields may be changed from a position in series with each other, or in parallel, as a whole, or two coils on each

field may have changeable connections of a similar character, and the motors as a whole (both fields and armatures), may also be arranged as entireties, either in series or in parallel.

For variations in speed of less extent than are involved in the greater changes of circuit connections, the auxiliary dead resistances may be utilized, and these more delicate gradations of speed may be effected by intermediate movements of the controller handle.

Condict pointed out two uses of combined "live" and "dead" resistances as his invention; (1) the temporary use of artificial resistances as a means of protecting the circuit and the apparatus at the time of shifting circuit connections, in making or breaking contact; and (2) the temporary use of supplementary resistances, at times when circuit changes are not necessarily in progress, for producing variations of resistance and consequent variations of speed of the motor, which could not be conveniently made by circuit changes only.

Since the introduction of the Condict method of series-parallel control it has superseded all other methods, and it is safe to say that practically every street car controller to-day employs it. The decision, therefore, rendered by Judge Townsend sustaining the claims relating to this method of control goes far towards placing the practical control of the electric railway business in the hands of the General Electric and Westinghouse Companies, who control the patent.

The decision on the spring suspension of the motors is also an important factor entering into the future of railroading. All manufacturers of electric railway motors have thus far found it necessary to flexibly support one end of the motor and to sleeve the other end upon the axle of the car. There is no obvious way of avoiding the patent. This decision, in connection with the decision on the controller patent, promises to be of great value to the General Electric and Westinghouse Companies to which the rights of both patents belong. It has been remarked that it was possible by a sufficient expenditure of time and money for litigation, to ultimately defeat any important patent, and the more important and valuable the invention, the more difficult it has been found to secure to the inventor his just reward. The encouragement afforded therefore to inventors generally, and to those engaged in the development of the electrical arts, by these two decisions will be considerable.

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## PICTURES OF NAVAL BATTLES.

One of the features which attracts the most attention at the New York Electrical Exhibition is the Edison projectoscope, by means of which what may be termed picture reports of the war are reproduced. A film taken at Havana shows the "Funeral of Nine of the Maine Victims"; it comprises over 2,500 pictures. F. Z. Maguire, who is representing the projectoscope at the Exhibition, states that one of the company's representatives will be among the first to land in Cuba, and that as one of its men was at Hong Kong when Dewey sailed for the Philippines it is the natural supposition that we shall soon have a realistic picture of the battle of Manila. It is needless to say how such a scene would thrill the beholder at this time. As a pleasure resort feature it is one of the best.





**Interesting Bits of Information from all Parts of the Country,  
Boiled Down for Busy Readers.**

The New Jersey Electric Railway has won in a \$10,000 personal injury suit recently brought against it.

The Citizens' Street Railway Company, of Muncie, Ind., has granted a substantial increase in wages to its motormen and conductors.

The Joliet (Ill.) Railway Company is making a number of changes at its power house and adding new generators, engines and boilers.

An experimental train equipped with dynamos for lighting driven from the car axle is now in operation on the Chicago, Rock Island & Pacific Railway.

The contract to construct the Catcetin & Myersville (Md.) electric railway has been awarded to F. S. Douglas, who expects to complete the work by August 1.

The plan proposed in the city council of Buffalo for a lower fare will have to wait till the legislature meets, as the street railway has an agreement with the city for a 5-cent fare.

B. F. Stewart, of Chicago, sued J. A. Henry, formerly the president of the Joliet Railway Company, for his commission in negotiating the sale of the road, and was awarded \$8,850.

The common council of Niagara Falls has, after about a year's consideration, denied a franchise to the Tonawanda Street Railway Company to lay tracks through certain streets in that city.

The Massachusetts Railroad Commissioners have recently issued a special report upon the plans for providing better street railway terminal and transfer facilities at Harvard square, Cambridge.

The Decoration Day crowd at Oshkosh, Wis., was very large but the transportation facilities proved ample. Manager E. E. Downs, of the Citizens' Traction Company, so arranged the schedule that excellent service was rendered.

G. D. Chapman and M. J. Meyers have been appointed receivers for the Syracuse & East Side Railway Company as a result of foreclosure proceedings instituted by the bond holders on account of the non-payment of interest. The property will be sold.

One Bramwell, alias Clark, who tried to pass himself off at Quincy, Ill., as a Pinkerton detective, was taken to Kansas City, Mo., where he was wanted on the charge of stealing \$2,000 worth of copper wire from the Metropolitan Street Railway.

The Red Bank (N. J.) & Long Branch Electric Railway Company has passed into the hands of a receiver. At the

request of President Greenburg, J. E. Degnam was appointed receiver. The road has been losing money constantly, the opposition to its construction and its great initial cost doomed it to failure. It will likely pass into the hands of some of the large trolley companies.

The directors of the Palmer & Monson (Mass.) Street Railway have bought the Forest Lake property, about 5 miles north of Palmer, and if the consent of the Railroad Commissioners can be obtained will transfer it to the company for a pleasure resort.

The Fox River Valley Electric Railway Company, of Appleton, Wis., is experiencing some difficulty in keeping the embankment, which carries its road over the slough, in repair. Muskrats dig holes in the clay, which are enlarged by the rise and fall of the water in the lake.

It is reported that the Metropolitan Company, of New York, had made a contract for the equipment of the 28th and 29th street line with the Hoadley-Knight motor. Twenty cars are to be put on, to be supplied with power from a newly erected station in West 23d street.

The Manhattan Elevated, of New York, must soon raise over two million dollars by a sale of bonds. The floating debt has in two years increased to \$1,136,729; and in addition it has to pay land damages. There are now in litigation taxes to the amount of over \$914,000.

The Monongahela Street Railway Company, on May 20, let the contract for the construction of the Homestead and Duquesne boulevard, including tracks between Homestead and Munhall. One fare will be charged from Pittsburg to Braddock and Homestead and two fares to McKeesport.

The Consolidated Street Car Company, of Fort Wayne, Ind., invited the children of the orphan asylums in the city to take a ride over the company's lines and see all the attractions at Robinson Park, including a theatrical performance especially prepared for them. On the succeeding day a like treat was given the newsboys of the city.

By reason of some dispute between the Toledo Traction Company and the Toledo, Bowling Green & Fremont Railway Company, as to the terms of the contract under which the latter operates cars over the tracks of the former, there was a lively war for a few days last month. It was attempted to keep the Bowling Green cars off the city tracks.

George J. Gould, president of the Manhattan Elevated Railway Company, New York, has accepted six of the seven franchises offered to the company by the rapid transit commissioners at the rental of  $\frac{1}{2}$  of 1 per cent of the gross passenger receipts. The company refuses to accept the Amsterdam avenue underground line at any price.

Announcements for the summer quarter, giving an outline of the course of study at West Virginia University, Morgantown, W. Va., have been sent to those interested. W. S. Aldrich, professor of mechanical engineering, calls attention to the fact that the university carries on its educational and scientific work throughout the year without interruption.

The San Francisco & San Mateo Electric Railway Company recently awarded the prizes in its semi-annual merit contest; five conductors received medals and \$5, and five motormen received medals and \$10.

Attorney-General Hancock, of New York, granted permission to the minority stockholders of the Kings County Traction Company, of Brooklyn, to begin suit for the appointment of a receiver to dissolve the company.

It is again reported that the Third Avenue Railroad Company, New York, will substitute the electric conduit for horse car traction. Plans are being prepared and the work will doubtless be completed within the year.

The inventory of the personal estate of the late George Handy Smith, ex-state senator, of Philadelphia, shows assets of over \$235,000, consisting for the most part of street railway stocks of Philadelphia, Pittsburg and Baltimore companies.

Willow Grove Park, the pleasure resort of the Union Traction Company, of Philadelphia, was opened for the season on May 28. The company has issued an attractive souvenir, a handsomely illustrated brochure, containing a fund of interesting information about the park and environments.

The Central Trust Company, of New York, has secured a judgment in the Federal Court for \$22,750 damages against John C. Hubinger, the principal owner of the Keokuk (Ia.) Electric Railway & Power Company; the litigation grew out of the purchase of the road, which was sold under an order of a state court and purchased by Mr. Hubinger.

The gross earnings of the Brooklyn Rapid Transit Company for the month of May have shown a gratifying increase over the corresponding time in 1897 and 1896. The receipts were \$528,324, which is more than \$40,000 above those of a year ago. For the 11 months, ending May 31, the earnings were \$5,095,189, being \$272,000 more than last year and \$440,000 more than in 1896.

A Cincinnati street car struck John Benson, a man 64 years of age, and carried him for 100 ft. on the fender. He was taken to the hospital with bruised arms and knees but he was very cheerful and had great confidence in his vitality. He said, "It was partly my fault but they can't kill old fellows like me so easily." He then combed his hair, brushed his clothes and returned to his home.

There are many articles lost on street cars and never claimed, and the companies usually have large quantities of such articles packed away in a store room. Instead of accumulating them the Metropolitan West Side Elevated Railroad Company, of Chicago, holds them for 90 days after the end of the month during which they are found and then returns them to the conductors or guards who sent them to the office.

Two of the graduates at Vassar, this year, came from families well known to the street railway fraternity. Miss Roberta McCulloch, daughter of Capt. Robert McCulloch,

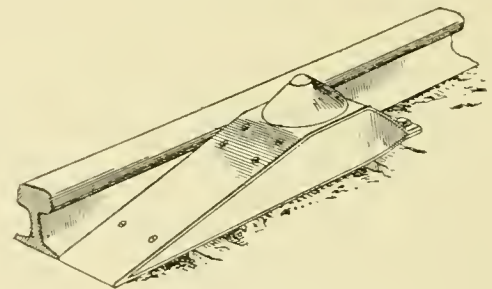
general manager of the National Railway System, St. Louis; and Miss Bean, daughter of W. Worth Bean, president of the St. Joe & Benton Harbor road. Both young ladies ranked high and graduated with honors. The graduation was attended by Mr. and Mrs. Bean and Mrs. McCulloch.

General Manager Hippee states that only two employes of the Des Moines City Railway enlisted on the first call, though the second call will probably take a number of others. The company issued the following bulletin:

"Any employe of this company who desires to serve the Government in military or naval organizations can, upon his proper release from such duty, and his return, have the position he now occupies with this company, or an equivalent one without any change in his standing."

### CAR REPLACER.

The car replacer, which is here illustrated, is one lately designed by L. W. Olmstead, which is said to operate very satisfactorily and greatly facilitate the work of getting a derailed car back onto the track. The block is of well-seasoned hardwood, 26 in. long, 9 in. wide, and of a thickness to suit the height of the rail; it is beveled for 13 in. at one end, and 4 in. at the other, leaving a level surface 9x9 in. on top. The



CAR REPLACER.

block is covered with boiler plate, held in place by counter-sunk bolts, which pass through the block and through nuts at the back, and terminate in spiked points. On the flat surface is a conical-shaped spool of chilled cast iron, held in place by a pin, but free to turn. In using the replacer it is so set that the flange of the wheel or the outer edge of the tread, as the case may be, will strike the spool slightly to one side of the center, and cause the latter to turn, throwing the wheel onto the rail.

### OHIO STATE ASSOCIATION MEETS.

The Ohio Street Railway Association held its annual meeting at Columbus, on June 9th. The attendance was good, but the reading of papers was this year displaced by discussions on practical questions without the preparation of the usual reports. A change has been made in the constitution by which the membership, heretofore limited to the executive officers of roads, is now extended to include superintendents and electricians. With this departure it is expected by next year to very greatly stimulate the work and increase the membership roll.

The local street railway officers made the visitors welcome, and entertained with a dinner and rides in special cars.



Officers elected are: President, S. L. Nelson, Springfield; vice-president, John S. Flood, Steubenville; secretary and treasurer, Charles Currie, Lima; the executive committee, in addition to the above officers, Judge W. A. Lynch, Canton; Thomas H. McLean, Toledo, and A. A. Anderson, Youngstown.

Next year's meeting will be held at Springfield, on June 14, 1899.

**MAIL CARS RECOMMENDED FOR KANSAS CITY.**

A recommendation will be made to the postoffice department at Washington for the annexation of the old territory of Westport to the Kansas City postoffice for free delivery purposes. The department will be advised that the present Westport office should be made a sub-station, that more carriers should be employed, that additional clerks should be engaged to expedite the business, and that contracts should be entered into at once with the street railway companies for the carrying of mail from the postoffice to the sub-stations of the city during the day.

**PARK FIRE IN CINCINNATI.**

A fire, which started during the afternoon of June 7 in the grotto building in the northeast corner of Chester Park in Cincinnati, caused a loss of \$20,000 and threatened for a time to destroy all the buildings in that beautiful resort. From the grotto building the fire spread to the merry-go-round, to the Edison Wargraph building, to a part of the amusement building and to the coral reefs. The car barn of the Cincinnati Street Railway Company adjoins this part of the park. The building is of stone and resisted the heat of the flames but the clock tower with the clock was destroyed as may be seen in the illustration. Other buildings, including the theater and scenic railway tower, were seriously damaged and but for the strenuous efforts of the fire department the flames would have been communicated to other buildings. The managers of the resort state that arrangements have been made to continue the performances in temporary structures and the buildings destroyed will be reconstructed at once.

**DEATH OF M. W. HALL.**

Our readers, and particularly those who are members of the Accountants' Association, will learn with deep regret of the death of M. W. Hall, secretary of the Camden & Suburban Railway, Camden, N. J. Mr. Hall has not been able to attend his office for several months on account of a long and serious illness. He will be remembered most pleasantly by the happy and impartial manner in which he presided at the organization meeting of the Accountants' Association, in Cleveland, where he endeared himself to all by a gentle courtesy and earnestness that



had much to do with the success of that meeting.

**AN INTERNATIONAL STREET RAILWAY.**

The Niagara Falls & Clifton Suspension Bridge Companies have leased the electric road privileges of the upper steel arch bridge across the Niagara gorge to the Niagara Falls Park & River Railway Company, of Canada. It will be recalled that the arch is to have double tracks, and the railway company will erect a station on the New York State end. This road runs along the top of the high bank on the Canadian side from Slater's Point above Chippewa to Queenston, opposite Lewiston. By means of the new connection it will be in close touch with the great crowds in both of the free parks at Niagara, the New York State Reservation on the one side and Queen Victoria Park on the other. The privilege thus secured is a most important one, and it would seem that the Niagara Falls Park & River Railway Company will catch the cream of all Niagara travel. The tracks on the bridge are expected to be ready by July 1, and about that time the cars will begin to run across the gorge, thus making an international line.

A package containing what are thought to be dynamite bombs was recently found in a New York elevated car.



FIRE AT CHESTER PARK, CINCINNATI.

## NATIONAL ELECTRIC LIGHT ASSOCIATION.

Twenty-first Annual Convention — A Number of Papers of Interest to Street Railway Men — Alternating Current Distribution — Standard and Special Machines — Public Control and Private Operation.

The 21st convention of the National Electric Light Association was held in Chicago June 7, 8 and 9. The beautiful banquet hall of the Auditorium Hotel was the place of the meetings, which were all well attended. No less than 230 delegates and visitors were present and many of these took part in the interesting discussions which accompanied the papers.

The president of the association is Samuel Insull, president of the Chicago Edison Company. The other officers are: First vice-president, A. M. Young, Waterbury, Conn.; second vice-president, George R. Stetson, New Bedford, Mass.; secretary and treasurer, George F. Porter, New York; master of transportation, C. O. Baker, Jr., Newark; executive committee: W. R. Gardener, G. A. Redman, H. A. Wagner, John A. Seely, A. J. DeCamp, E. H. Stevens, F. A. Gilbert, W. W. Bean and W. McLea Walbank.

Some of the papers contained information regarding the generation and distribution of electric current, which is as pertinent to street railways as to lighting. Such extracts of the papers we reprint. The subject of alternating currents excited much more interest and discussion than any other topic before the convention. This is also a matter of importance to street railway men, for alternating currents are coming into use as a means of power transmission. The engineers who are planning the new interurban lines are all considering the advisability of building but one power station and using alternating current transmission. One of the interurbans out of Chicago which is nearing completion has an alternating current transmission with rotary transformers at suitable points for conversion to direct current to be distributed and used in the car motors.

The trend of the discussion in the convention seemed to be that it was best to use a direct current for distribution, but a great saving could be effected by alternating current transmission over considerable distances. The lack of a suitable motor was a serious barrier to the application of alternating current for power purposes. While it would hardly pay to change the machinery in the large central stations now furnishing current the stations in the future will have alternating current generators and the current will be transmitted to the vicinity to be used and there converted to direct current for local distribution.

There were no facilities provided for exhibits, but several of the electrical companies had headquarters at the hotel. The Westinghouse Electric & Manufacturing Company elaborately decorated its rooms on the parlor floor with flags and national colors and exhibited pictures and pamphlets describing the apparatus manufactured. The General Electric Company and the Electric Storage Battery Company also had attractive rooms, where representatives welcomed friends and visitors.

The social features of the convention included a banquet, tallyho parties for the ladies during the day, inspection of electric plants in the city, theater parties, carriage drives, etc.

Officers for the ensuing year were elected as follows: A.

M. Young, Waterbury, Conn., president; E. H. Rollins, Denver, Col., first vice-president; F. A. Gilbert, Boston, Mass., second vice-president; George F. Porter, secretary and treasurer; C. O. Baker, Jr., master of transportation; Samuel Insull, Samuel Scovil, E. H. Atkinson, F. A. Copeland, John A. Seely, A. J. De Camp, E. H. Stevens, W. W. Bean and W. McLea Walbank, members of executive committee.

The Northwestern Electrical Association has usually held its meetings at a convenient summer resort, so that members might combine their summer outings with the business of attending the convention. This year this association planned a lake trip from Chicago to Duluth, holding the convention en route, and the steamer "Northwest" left June 10, the day after the National Electric Light Association held its last meeting, and many of this latter association took advantage of the opportunity offered to go on the excursion.

### President Insull's Address.

After a brief introduction Mr. Insull proceeded to discuss a number of the questions which are of great importance to the electrical industries, street railway as well as lighting. He said in part:

#### STANDARD VS. SPECIAL MACHINERY.

A matter which has called forth during the last year considerable discussion is the question of the use of standard apparatus and the tendency towards the specification of special machinery on the part of electrical engineers. This course is not by any means confined to large work, but is followed by some engineers whether they are designing a small isolated plant or are projecting a large modern central station. It would seem to me to be of paramount importance to the manufacturer and user that both should co-operate in eliminating as far as possible from the business the necessity of building and using special types of machinery. This can only be done by the adoption of standard specifications for various standard types of apparatus. A committee of the American Institute of Electrical Engineers has already taken this subject under consideration, and I believe that we will be serving alike the interests of the manufacturers and users of electrical apparatus if we will take some action with a view to co-operating with the Institute and other bodies in this matter. In drawing attention to this subject I speak with an appreciation of the position of both manufacturer and user, having had more or less connection with the manufacture of electric apparatus and the manufacture of electric current. Constant duplication of parts resulting in constant duplication of a given piece of machinery means, as any manufacturer will tell you, constant reduction in cost. Variation from a given type means increased cost and even the wiping out of an apparent profit. In the last year or so there has been a great deal of discussion in England prompted by the success of American manufacturers in obtaining large contracts for electric traction work in Great Britain, and the inquiry has often been made, how is it possible for American electrical manufacturers, with high wages against them, to compete with English builders, whose scale of pay to their workmen is on a very much lower basis. If you will examine into the amount of electric traction machinery manufactured in this country under a system of constant duplication and



the use of special tools, and then visit the electrical establishments on the other side of the water and note the tendency there towards specializing each particular job, you will soon recognize that the reason for low cost and consequently low selling price on this side of the ocean, is brought about by the fact that in America this class of work is largely designed by the manufacturer, and as a natural result is the duplicate of something already produced, whilst on the other side of the Atlantic the builder of the machinery works from the plans of the electrical engineer, which necessitates his producing something different to fill each different contract. In one case the machinery is really manufactured; in the other case the builder runs a jobbing shop. Unfortunately during the last few years American users of electrical apparatus have somewhat departed from the pursuance of what is really a fundamental principle of American manufacture, namely, the use of existing types which are turned out in large quantities with special tools with a view to the lowest possible cost of production. The electrical engineer for the purchaser has been permitted to draw up specifications which have tended towards the specializing of apparatus, necessarily interfering with rapid manufacture and low cost of the product. The disadvantage to the manufacturer is apparent. It is turning our large electrical works from manufacturing establishments into jobbing shops, cutting down their capacity, increasing their labor cost and lengthening the time that it takes to produce a given article. Looking at it, therefore, from the point of view of the manufacturer, the capacity of his plant is reduced and consequently his interest and general expense cost is higher; his labor cost is increased; and if he finds himself unable to increase his selling price, his shop must be run at a loss instead of at a profit.

The user is necessarily interested in low cost of production on the part of the manufacturer, as he cannot expect to purchase apparatus except at prices which yield a return to the maker. From this point of view alone it would seem to me to the interest of the user that he should co-operate with the manufacturer with a view to standardizing apparatus, eliminating unnecessary variations from a given type and providing specifications for machinery calling for a given capacity at a given efficiency. Such a course would lead to low cost of manufacture and consequently low selling price, coupled with rapid production.

Another objection to special apparatus is the expense and delay in obtaining duplicate parts in case of break-down. The fear of delay under such circumstances often necessitates the user carrying the duplication of his plant to a point entirely unnecessary when standard apparatus is used. Capital investment and consequently interest cost is thus increased, not only by the purchase of apparatus which of itself is expensive to build, but also by the duplication of investment which I have pointed out must of necessity follow.

A further point which should be borne in mind in connection with the lack of standard specifications is the opportunity that it gives to the unprincipled manufacturer to dispose of his second-rate apparatus to the uninitiated. We talk of a machine having a given capacity; but under what conditions should it operate to develop this capacity and how often does it occur that a dynamo machine is rated entirely too high and at the cost of its efficiency? How much miscellaneous material used in connection with the industry is absolutely unfitted for the purposes for which it is sold? Surely all of us, manufacturers and users, are interested in maintaining the highest possible standard of work and eliminating alike from our central station systems and the installations for our customers worthless appliances whose only recommendation is their apparent cheapness, whereas, as a matter of fact, they are really the most expensive that can be bought, because they are unfitted for the purposes for which they are intended. \* \* \* \*

I do not want my remarks on this subject to be taken as in any way censuring the many electrical engineers who have by their special training and natural ability done so much to develop the industry with which we are connected. From my experience I am satisfied, however, that from the point of view of the user, the designing engineer who adapts his requirements to

the standard apparatus of a first-class manufacturer, is able to produce a plant of more satisfactory character and more economical to operate than that designed by those engineers whom I regret to say are sometimes influenced by the desire to use machinery which they can claim as their own handiwork rather than use something that would be quite as satisfactory and has the advantage of being the regular product of an established manufacturer. \* \* \* \*

#### PUBLIC CONTROL AND PRIVATE OPERATION.

A subject of growing importance to a number of our members is the question of the public ownership and operation of the undertakings now operated by electric lighting companies. The agitation in connection with this subject has called forth a great deal of discussion, partly by those interested in it simply with a view to extending the influence of political parties, and partly by serious disinterested thinkers who believe that the best interests of the greatest number are to be obtained by the creation of a municipal socialism, which, if carried to its logical conclusion, must ultimately result in municipalities performing, with others, such public service work as we are engaged in, and also in producing the food we eat and the clothes we wear. To those occupied in the management of electric lighting properties it does not seem possible that the movement in favor of municipal operation of electric lighting plants, based upon the assumption that a municipality can produce electricity cheaper than, or even as cheap, as a private corporation is well founded. We all realize, from the close attention we have to give to our own affairs, that self-interest and the necessity of getting a return on our investment are the first essentials to the economical administration of large enterprises. While I do not pretend to claim that electric lighting companies are beyond reproach, I wish to point out that many of the evils complained of as pertaining to corporate management are the direct results of the enforcement of unwise conditions through legislative action. Ill-advised efforts are often made by legislative bodies to secure advantages in the direction of control which cannot be obtained without giving an equivalent in protection to the industry. This causes the investor to feel that his property is being attacked and compels him to resist such legislation. The result is a feverish agitation, crimination and recrimination, between the would-be improvers of municipal government and the owners of corporate properties without reaching a conclusion satisfactory to either. The fallacy of the so-called reformer's theory results from looking only at what he calls the injurious effects of corporate management without taking into account its indisputable benefits. He does not seek for the cause of the trouble. If reformers will take accurate account of all the points in the problem they will discover that the evils complained of result from errors in legislation designed to determine the relations between municipal bodies and electric lighting companies. It seems to me that the claim that municipal operation is the universal cure for all diseases for which electric lighting companies are supposed to be responsible, merely proposes the substitution of political in the place of industrial management. This raises the question: Is the administration of municipal affairs in the various cities throughout this country so economical as compared with the management of private industries and the class of service rendered so efficient as to justify the increasing of the burdens already imposed upon municipal government? It appears to me that a correct division of power and responsibility requires political government to control private industrial management. Where political government and industrial management are merged into one interest, the power of control is seriously impaired, since a political administration cannot be reformed without overturning the party in power.

I cannot bring myself to the belief that the citizens of this great country are in fact opposed to large aggregations of capital in corporate form, as such aggregations are absolutely necessary to the operation of all great undertakings by private enterprise. It is as impossible to operate such vast affairs with individual capital, as a personally owned business, as it is for us to live without municipal, state and national governments. The misunderstandings which from time to time occur between com-

munities and the managers of electric lighting companies will, to my mind, disappear entirely if the relations between the two are correctly founded on the basis of public control with corresponding protection to the corporations operating this industry. It would seem to me to be a very proper function for this association to address itself to educating the public to a definite legislative policy which will be fair to the municipalities, securing to the public the best service at the lowest possible price, and protect corporations by giving them franchises, which, while conserving municipal control, will insure to the investor the permanency of the undertaking.

#### COMPETITION IS NOT THE TRUE REGULATIVE FORCE.

It is supposed by many who discuss municipal affairs that the granting of competitive franchises for public service work is the true means of obtaining for users the lowest possible price for the service rendered, whereas, as a matter of fact, the exact opposite is the ultimate result. This is proved by results in all large cities where the most severe competition has taken place. Acute competition necessarily frightens the investor, and compels corporations to pay a very high price for capital. The competing companies invariably come together, and the interest cost on their product (which is by far the most important part of their cost) is rendered abnormally high, partly owing to duplication of investment and partly to the high price paid for money borrowed during the period of competition. The selling price of a service should be based on its cost, and in any business such as public work, where the investment is large and the annual turnover is comparatively small, if the item of interest be unnecessarily augmented, it must be reflected in the price paid by public and private users.

While it is not supposed to be popular to speak of exclusive franchises, it should be recognized that the best service at the lowest possible price can only be obtained, certainly in connection with the industry with which we are identified, by exclusive control of a given territory being placed in the hands of one undertaking. In most European countries public service operations enjoy exclusive franchises, under proper control, and are able to obtain capital for their undertakings at the lowest commercial rates, thus materially affecting the cost of their product, of which interest, as I have already stated, is necessarily so great a part. In order to protect the public, exclusive franchises should be coupled with the condition of public control requiring all charges for services fixed by public bodies, to be based on cost, plus a reasonable profit. It will be found that this cost will be reduced in direct proportion to the protection afforded the industry. The more certain this protection is made the lower the rate of interest and the lower the total cost of operation will be, and consequently, the lower the price of the service to public and private users. If the conditions of our particular branch of public service are studied in places where there is a definite control, whether by commission or otherwise, it will be found that the industry is in an extremely healthy condition, and that users and taxpayers are correspondingly well served.

#### COMPENSATION FOR FRANCHISES.

When prices for services are based on cost it matters not whether in the establishment of a system of legislative control provision is made for paying a portion of the receipts direct to the municipality. If the public demands a percentage, surely we can afford to pay it, as it would simply be added as an item of expense on which our selling price would be figured. If the public does not demand a percentage, this selling price would be proportionately less. It is simply a question as to whether our municipal bodies prefer to raise a portion of their income by taxing their citizens through the agency of public service corporations, or whether they prefer to raise that portion of their income by collecting it direct from citizens themselves. Revenue raised by a percentage on gross receipts of the electric lighting business would, at the present time, however, seem to be somewhat unfairly obtained in cases where the selling price is subject to legislative control and based on cost of service, as the result would be that a small minority of citizens using electricity would be forced to contribute largely to the public revenue, whereas the benefits enjoyed therefrom would be to the advantage of the whole community.

#### TAKING PRIVATE PROPERTY FOR PUBLIC USE.

Another point that should be included in a proper scheme of public control is a condition under which the municipality would have the right to purchase the undertaking. Such a right should include a direct obligation on the part of the municipality to purchase the property at a fair price whenever it is thought desirable that the industry should be operated by the municipality. The possibility of the exercise of the right of purchase by the municipality would of itself make it to the interest of the owners of the property to do their full duty in their relations to the public. On the other hand, if a community licenses a corporation to perform a certain public service, and if that corporation invests its money and develops its business, surely it is unfair for that community to go into the same line of public service work itself without first purchasing the existing plant. If this is not done the value of private property will be destroyed without just compensation being made therefor in an attempt to secure a public benefit. I do not believe that the people as a whole are so unfair as to demand that such a course shall be taken.

My recommendations on the subject, which I have just presented, are by no means original. Most public service corporations in Great Britain are run on practically the bases indicated, and in more than one state in the union corporate legislation has taken the same direction.

I would summarize the position which I think we should take on this subject in just two sentences.

First—Franchises granted to public service corporations should secure them the same degree of protection in their rights to their property as is enjoyed by other investments.

Second—Public control of charge for service based on cost plus a reasonable profit, and eliminating the factor of competition, is the proper safeguard for the interests of users, taxpayers and investors.

#### General Distribution from Central Stations by Alternating Currents.

BY HERBERT A. WAGNER.

Ever since the installation of the first few pioneer alternating current central stations, just ten years ago, we have heard it predicted with persistent reiteration that for the distribution of current for lighting from central stations direct current was a thing of the past and that in a few years the alternating current transformer system would hold the field without a competitor.

To many, this prediction may seem to have been fulfilled, considering the enormous number of alternating current plants, compared with direct current, that have been installed, and the remarkable impetus given to electrical industries by the development of alternating currents.

The great success achieved in the transmission of power by polyphase alternating currents in the last three years, has but strengthened this general belief, and left fewer champions to adhere to the direct current cause.

These great achievements, I say, have led the enthusiast to think all progress confined to alternating systems of distribution. Deeper investigation, however, shows that while in point of number the alternating current stations, reaching into the thousands, completely overshadow those of direct current, there are few really large stations, outside of water-power plants, that are today employing alternating currents for distribution, and that while enormous investments have been made in direct current stations in our larger cities, comparatively small amounts have been invested in alternating current work.

The alternating system was heralded as providing a means of distribution with a great reduction in first cost of plant, and for years the development of the system has been made with this the principal end in view. On the other hand, direct current distribution in the form of the Edison three-wire system, has been steadily and intelligently developed to the highest standard of economy of operation, simplicity and permanence. In the same city, alternating current stations have not, as a rule, been successful in competition with three-wire stations; their service has not been as good, and their profits have been smaller.



I may startle many by stating frankly the discouraging fact, which has been barely whispered at times, that, judged by the standards of the magnificent Edison properties in many of our larger cities, few alternating current central stations in the United States have been a success. Do not imagine that this damaging admission, however, is an indication of any loss of faith on the part of one who has been identified with alternating current work since its *début*, as it were. Far from it. The fault lies, not with the alternating current itself, but with its application. Its few apparently inherent deficiencies, such as the difficulties of operating motors and arc lamps, have been shown to have been only awaiting discovery and development, and were at our disposal almost as soon as these important divisions of central-station service were operated with success from the Edison three-wire system. These can, therefore, hardly be held responsible for the difference in the commercial results obtained with the two systems.

As I have said, the ends in view in the development of the two systems have been radically different. The one was to produce a given amount of light for the minimum of investment; the other was to provide a permanent investment that would render the maximum of profit. These standpoints in general mark the difference between the manufacturer and the user, and we find these two systems developed in this way—one almost entirely by the manufacturer, and the other by the combined efforts of the various users. The results are the natural effects of progression along these lines.

Few opportunities have we had of comparing the two systems from the same standpoint and under like conditions. The purpose of this paper is to show the alternating current applied from the same standpoint, compelled to fulfill the same conditions, and then to compare the results with the best produced with direct current.

To better contrast the different methods of distribution, we will review briefly those in general use before describing the most recent developments.

The early alternating current stations were installed on the principle that the drop in lines with distribution at 1,000 volts was so small that it was practically negligible. Two wires were accordingly run out from the station, passing along those streets where light was to be furnished, and lights were connected at any desired points between the station and the farthest end, without reference to such trifling considerations as difference in potential. Distribution was attempted in this way for years, and in many places is still in operation. Lines are even being constructed today without any notion of a system of feeders and mains, although an almost perfect system for the maintenance of uniform pressure was in operation in many Edison stations before the first alternating station was in existence. Fortunately for the operators of such models of simplicity, the current delivered has usually been so small in quantity that with the proverbial No. 6 wire, which seemed to possess virtues not affected by distances, the difference of pressure between neighboring customers rarely exceeded 10 per cent.

A few more enlightened experts—plants were always installed by experts in the early days—eventually conceived the novel idea that if the drop, a little of which they had discovered by that time, could be confined to a greater extent to those portions of the lines where there were no lights, some might be spared from the lighting districts. A few feeder lines were therefore stuck in here and there to boost up the pressure where it was lowest.

The regulation was all effected by means of the dynamo field rheostat, and the pressure indicated by a voltmeter on the secondary of a transformer whose primary was connected to the bus bars on the switchboard. A few lamps were also often operated by the same transformer to light the switchboard or other parts of the station. The station attendant was, of course, in absolute ignorance of the pressure at any point on the lines where lamps were used. The pressure was therefore usually run high enough to be on the safe side. The attendant was sometimes instructed to let his voltmeter needle follow gently the manœuvres of his ammeter, as there was thought to be a more or less intimate connection between volts and amperes and the volts ought not to be allowed to get too far behind.

If any one ever breathed a suggestion of pressure wires, it was probably his last breath. At any rate, he was never heard of again. What! pressure wires with alternating current? Preposterous idea. Alternating and progression were considered almost synonymous terms. Antiquated ideas must be abandoned.

This faintly whispered need might, however, be heard again, so, to meet the emergency, a compensating voltmeter was produced that could be adjusted for any drop in the lines. It was ingeniously arranged so that a small series transformer in the main line would send currents opposing those operating the voltmeter, thereby making the needle or index drop back approximately proportionately to the current in the line. This device was a great help, and caused the drop in lines to jump into prominence at once. It would be quite perfect if the drop in alternating current lines were proportional to the current, but it is not. The power factor of ordinary alternating current systems is usually quite low at light loads, and, except with very small wire, an ampere may therefore produce much more drop proportionately at light load than at heavy load.

In Europe it is, to some extent, the practice to use transformer sub-stations with low potential distribution from these points. Transformers are cut in and out at these sub-stations by attendants according to the demand for current. It is doubtful if, after paying interest on the investment in property and housing for these transformer stations, together with the investment in instruments and switches required, and the attendants' wages, there is very much saving effected. \* \* \* \*

Comparing the cost of individual transformers and high-potential distributing mains with the three-wire system of mains at low potential, we do not find a great difference in first cost in favor of the alternating. We do find, however, that the Edison feeders for the same distance cost about 31 times as much as for alternating current at 1,100 volts, 125 times as much at 2,200 volts, or 500 times as much at 4,400 volts. It would then appear that if we could apply alternating current to the feeders at high potential and transform down for the mains, we might reach the lower first cost of the ordinary alternating current system and possibly retain all the best features of the direct current. To accomplish the former, the transformers must be provided at a small proportion of the cost of the alternating-current feeder, and to do the latter, they must not increase the average losses in the system. It is obvious that we could with alternating current move our station to any reasonable distance from our centre of distribution, and at comparatively small additional cost for feeders. The whole problem then seems to come down to transformer efficiency and means of regulation.

To consider the matter of regulation first. We see at a glance that we cannot use the direct current method of regulation by supplementary bus bars, but we can use the booster method, and can, moreover, apply a static booster to each feeder to regulate within any desired limits and with as small gradations as necessary. In fact, the booster method of regulation was first applied to alternating current distribution, and operates with much less average consumption of energy than either the supplementary bus or direct current booster method. In this important consideration we can therefore improve on and simplify direct current methods.

The means of regulation having been in this way provided for the feeders, it remains to be considered what we shall do to eliminate the effects of transformer drop. As we have determined on a secondary low potential, three-wire distributing system of mains, we can altogether dispense with high potential mains and limit the high potential to the feeders. If we do this, we can conveniently have the transformers of the same unit capacity as the feeders, and arrange each with its primary connected to its independent feeder, and its secondary feeding into the three-wire mains. We know that the effects of our feeder drop are eliminated if we regulate by pressure wires from the feeder ends. In the same way the effect of our transformer drop may be eliminated by bringing pressure wires from the secondary terminals. The feeder drop and transformer drop therefore become one, and are cared for in the same way. We can even secure better general regulation than with the direct current system, as we have a better form of feeder regulator and have eliminated the effects of transformer drop.

Now, to return to the transformer itself and its efficiency. It is evident that, with this system, the transformer capacity need be no greater than that required for maximum station load, instead of more than twice that amount or nearly equal to that required for the total number of lamps connected. This at once doubles the average load on our transformers, and raises the average efficiency. It also incidentally reduces the first cost of transformers in still greater proportion. We also know, however, that transformer efficiency at light loads is dependent on the iron loss, and that this is interdependent with the regulation or drop. If we can increase the drop, we can increase the iron loss, and thereby greatly increase the average efficiency. Having provided against any interference with the regulation of the system by the transformer drop, we can afford to increase that to the heating limit of the copper. In this way, a 100-k. w. transformer can be built with an average efficiency of over 98 per cent. The entire transformer loss can, moreover, be more than made up by the less loss in feeders, which we would naturally have with alternating current.

We have thus eliminated the two features in which the ordinary alternating current system of distribution has been inferior to the direct current, and have provided means for obtaining better regulation and higher efficiency at a very much less cost of installation than with the direct current system.

This system was conceived several years ago, and it has since been my good fortune to have an opportunity to install a system

formers can be readily maintained at all times if desired. This is a very important consideration when very heavy loads or overloads are to be carried. The distribution of load on any large system is constantly changing as new customers are connected, and in large Edison stations certain feeders often become so overloaded that it is found necessary for their safety to put resistance in series with them to force some of the current to other feeders. The possibility of overloading any individual feeder beyond its share is absolutely provided against in the system described.

In the figure are shown four curves of station distribution efficiency. No. 1 is that of a representative Edison three-wire, direct current station. No. 2 is the new alternating current system described. No. 3 is the usual alternating current system employing separate transformers for each customer or for adjacent customers, the best modern transformers being used. No. 4 shows the same system, but with the average transformers found on the lines of most existing stations. These curves were plotted from the following data obtained from actual practice.

	No. 1. Per cent.	No. 2. Per cent.	No. 3. Per cent.	No. 4. Per cent.
Feeder loss .....	24	8	10	10
Main loss .....	2	2	2	2
House wiring loss .....	1	1	1	1
Transformer loss, iron .....	..	.23	6	12
Transformer loss, copper .....	..	2.7	1	.5

Total loss at maximum station load .....	27	13.93	20	25.5
Efficiency at maximum station load .....	78.7	87.9	83.3	79.6

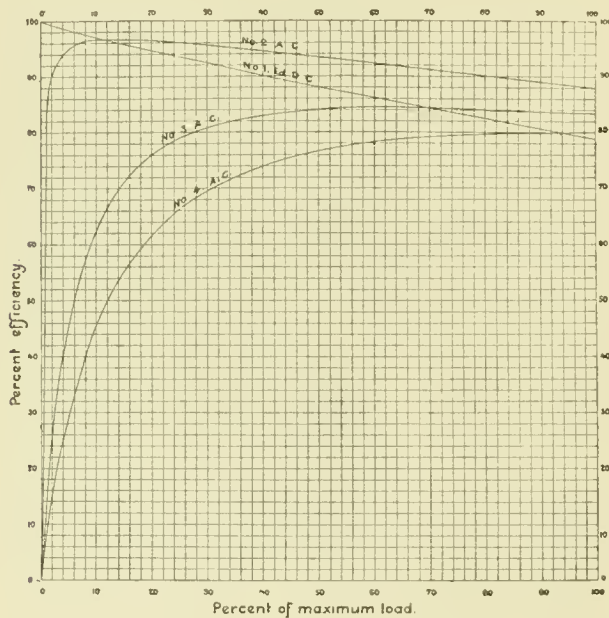
The efficiencies of distribution at assumed average loads are shown to be as follows:

	No. 1. Per cent.	No. 2. Per cent.	No. 3. Per cent.	No. 4. Per cent.
Load, 25 .....	94.1	95.8	78.4	66.6
Load, 20 .....	94.8	96.2	75.3	61.4
Load, 15 .....	96.1	96.5	70.3	54.3
Load, 10 .....	97.3	96.4	61.9	45.1

At maximum load it will be noticed that the efficiency of alternating current No. 2 is 10 per cent higher than No. 1, the direct current. This means that the same energy can be delivered with 10 per cent less capacity in generators, engines and boilers, or a difference of 10 per cent in the first cost of generating plant. It is pertinent to remark here that alternating current generators also have a much greater margin for overload for short periods than direct current generators. The efficiency at average load, or the all-day efficiency of the No. 2 alternating current system, is also shown to be appreciably higher than the direct current. In large central stations the average load is generally found in practice to vary from about 15 to 20 per cent of the maximum, and it will be noted that from 12 per cent average load up, No. 2 curve for the special system of alternating current distribution shows a higher efficiency than the direct current. \* \* \* \* \*

Several large three-wire, direct current Edison stations are beginning to employ alternating current to extend their lighting territory beyond that possible or profitable with low tension current. This is a recognition of alternating current which would not have been considered for a moment a few years ago. They now propose to use alternating current to transmit their energy at high potential to a distant substation, where it will be transformed to a lower pressure and then again transformed by means of rotary transformers to direct current, which is in turn distributed over the three-wire Edison system as if generated in the ordinary way. This is a very beautiful and instructive application of alternating currents, and ingeniously designed machinery. It gives the manufacturers a chance to sell additional machinery, swells the company's real estate investment and gives work to the unemployed to operate the substations.

The loss in the conversion to alternating current and back is about 15 per cent in addition to the loss in static transformers and lines. This distribution might be accomplished without the additional machinery.



CURVES OF DISTRIBUTION EFFICIENCY.

of this kind on a large scale, which is now in very satisfactory operation. It is laid out exactly as a three-wire Edison system would be, except that there are no subfeeders. A network of mains is planned as if for use with direct current. The feeders are all designed for 110-k. w. maximum load at 1,100 volts, and at each feeder end is placed a 110-k. w. transformer feeding into the three-wire network in the same manner and at the same points as with the direct current system. The transformers are located in manholes of suitable design. From the secondary terminals of each transformer, pressure wires are run back to the station. Each feeder has an independent regulator by which the pressure can be raised or lowered. There are no primary mains, nor any connection whatever between the primary feeders. The regulators perform two functions. They are used to maintain the proper pressure as indicated by the voltmeters and also to divide the load between transformers in any way desired as indicated by the feeder ammeters. It is possible to shift the entire load from one transformer and feeder to an adjacent transformer in this way without sensibly affecting the pressure on the system, and an equal division of load between trans-



A much higher efficiency of distribution, and better regulation, could be secured by using the alternating current system as it is, without transformation to direct current, and everything could be controlled from the main station without employing labor or apparatus at substations. Why do they not use it so? They say that many things cannot be accomplished as well with alternating current. If that is a challenge, we will accept it and try conclusions with them. Let us then anticipate these various objections and see what they amount to.

We have already seen how a properly designed system of distribution for alternating currents may be made to exceed the direct current system in efficiency, taking the latter under its most favorable conditions. If we then add to the usual losses in the direct current system the losses in double rotary transformation and in static transformers, the very great difference in favor of the alternating current is still more marked.

It has been shown how very simple and reliable regulators can be provided for each alternating current feeder, which will secure the closest possible regulation over any range desired, and this can be effected at a loss of less than one per cent. Such close regulation can only be secured with direct current by the use of a number of generators connected to auxiliary bus bars, or by connecting the feeder ends to adjustable resistance connected between the busses of two or more generators. The first cannot be realized in a rotary transformer station, and the last is quite wasteful of energy. Regulators placed on the alternating current feeders of the rotary transformers control alike the pressure on each rotary, and all the direct current feeders supplied by the same, in exactly the same way as field regulation does on a direct current generator. Such regulation can only be effectual with a number of small rotaries not operated in multiple. The best regulation can, therefore, undoubtedly be secured with the alternating current system. \* \* \* \*

#### MOTORS.

The greatest argument used against alternating current used to be that it would not run a motor. It has long ago proved that it can, and that without a commutator. This subject now brings us to multiphase systems. There are two of these systems in general use, the two phase and the three phase. Other systems are but modifications of these and will be mentioned as such. Motors can be operated with equal facility and efficiency on either system and have many distinct advantages over direct current motors.

For long distance power transmission the three-phase system shows an economy in copper; but for lighting, or for lighting and power combined, it is not at all well suited. I might say that where lighting is a distinct feature, and first class service is to be rendered from a large station, the three phase system cannot be used successfully. On even the best generators, the windings are so entirely interdependent that a change of load on one phase will affect the pressure on the other two; but a defect even worse is the impossibility of regulating the phases independently for drop in the feeders if the load happens to vary on any two. Any regulator placed in circuit with one phase will effect about the same change of pressure in the adjacent phase within the usual limits of regulation. Regulation is then a question of the best possible averages, and at best is but guesswork. With the feeder and transformer drops found economical in practice, it would be practically impossible to keep the pressure sufficiently constant for high efficiency lamps. The complication of wiring is also very serious, especially if the Edison three-wire system is used for distribution, as six wires would then be required, forming six circuits that must be kept balanced.

The two phase system is subject to the same objections unless the two phases are used separately for lighting, in which case we have the complication equivalent to twice the number of generators and feeders.

For good regulation and simplicity, the single phase system cannot be equaled by any multiphase system.

The so-called monocyclic system is a modified two-phase system in which current is distributed for lighting on a single phase circuit only, and a third wire carries current in quadrature to the first, which, in connection with the first, is transformed to a three phase relation wherever it is desired to operate motors. The regulation of this system can be made al-

most as good for lighting as the single phase, and can be as simply effected. The third wire adds complication, but no balancing is required, as all the lighting is done from single phase on two wires. If low tension, three-wire distribution is attempted with this system, a fourth wire must be used for power distribution. \* \* \* \*

#### STORAGE BATTERIES.

Here we come to the direct-current advocate's last and greatest stronghold. To this he retreats with great confidence of safety. We may ask first whether storage batteries have yet been proved to be a valuable adjunct to the central station, cost and maintenance considered. It is true they are being tried by several large stations, and we watch eagerly for the results. They equalize the station load to a greater or less degree, and cut down the generator capacity for the peak. Are they, however, cheaper than generators, engines and boilers of the same capacity? Are the losses in transformation less than the cost of a few more attendants? Is their maintenance less expensive than that of generating apparatus? These questions can not as yet be answered in the affirmative. But if the battery man's most sanguine hopes be realized, what then? If rotary transformers are good enough for the direct current man to use to change the direct current to alternating current, transmit a good proportion of his load to a distance and transform again to direct current, why should not the alternating current man use them to charge his batteries and then to transform their output back to his pet form of current? Loss in transformation, do we hear some one say? Not any more than with our contemporaries' long distance transmission system, and, in this instance, they are small and unimportant, we are told. There is at least one station in the country where storage batteries are being used in this way, and I believe with success, as storage batteries go. \* \* \* \*

In summing up, we find the following marked features in which the alternating current, properly installed, has been shown to have pronounced superiority over the direct current:

- Highest possible efficiency of distribution and operation.
- Best regulation.
- Largest territory desired readily supplied from one station.
- Comparatively small cost of feeders, effecting enormous saving in investment.
- Least cost of real estate.
- Cost of installing and operating sub stations entirely avoided.
- The only system in which all classes of service can be supplied from one type of generator.
- Greatest flexibility.

#### Lachine Rapids Plant and the Cost of Producing Power for Generating Electricity Therefrom.

BY W. MCLEA WALBANK, MANAGING DIRECTOR.

In order to allow of a fair comparison with other plants, of the cost of producing power for generating electricity from the Lachine Rapids plant, the writer considers it desirable to give a brief outline of the hydraulic as well as the electrical equipment of these works.

The world renowned Lachine Rapids, as you are all doubtless aware, are situated on the St. Lawrence river, a short distance from the city of Montreal. The idea of converting the wasted energies of these turbulent waters and harnessing them for the use and convenience of man, was not new. As far back as 1866, a company was formed, whose object was to erect dams and construct large hydraulic works, about a mile lower down the river, than the site of the present power house; the object being to induce factories to establish their works at the rapids, for at that date, the possibilities of electric transmission had not been demonstrated. The scheme, however, never materialized, and since then various projects have from time to time been talked of, but never matured.

In the fall of 1895 the Lachine Rapids Hydraulic & Land Company, Ltd., commenced its operations. The directors commenced work, only after having fully satisfied themselves upon the difficulties to be encountered and overcome, and carefully studying the question of back water, frazil and anchor ice, and went in with a determination to succeed.

The company was honestly formed without "ground floors" or "subcellars," with a bona fide capital, on which every share represents \$100 cash. This, the writer considers, has direct bearing on the cost of producing electricity, because a company, handicapped by what is called watered stock, or exorbitant promoter salaries, has to pay interest on money it never had the use of. Having therefore formed a company on a solid and firm financial basis, the property fronting on the Lachine Rapids and controlling the waterpower privileges was secured, and operations for the development of the water power commenced.

HYDRAULIC DEVELOPMENT.

The hydraulic plant consists of a main dam and power house, 1,000 ft. long, and a wing dam and guard pier, 5,000 ft. long, forming a head race or basin, with an average depth of 12 ft. in low water. To secure this it was necessary to divert the waters of the St. Lawrence and lay bare the bed of the river for a distance of over a mile and remove over 400,000 cu. yds. of rock.

The main dam which is constructed of a series of isolated cut stone piers, with head gates and stop logs, furnishing in all 36 flumes and three waste weirs, at the same time, forming foundations for the power house and turbine sheds.

The total development will, when completed, consist of 72 vertical turbine wheels and 12 generators. The wheels are con-

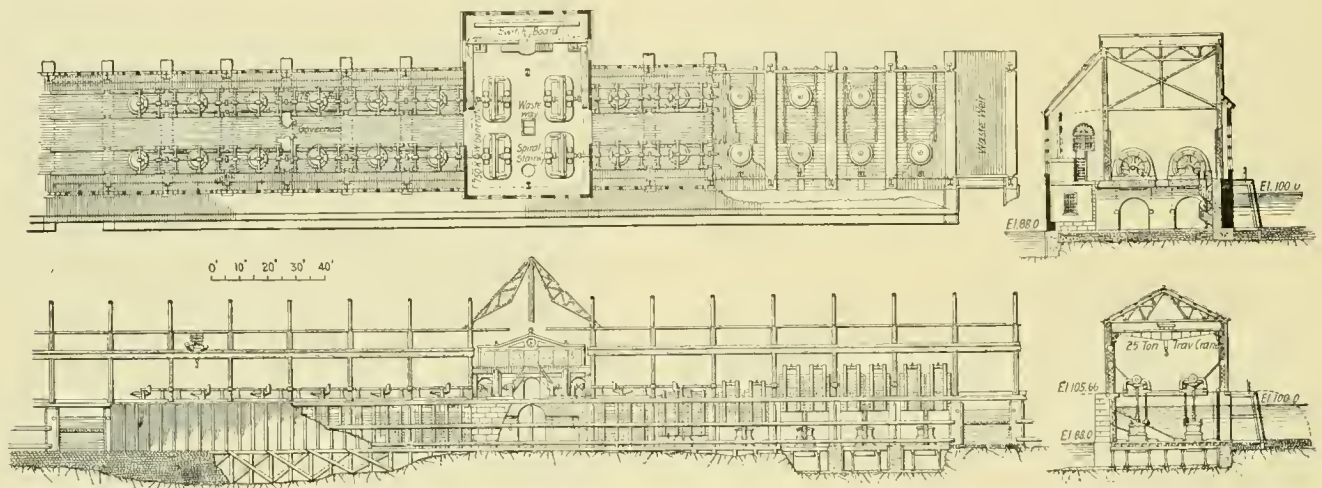
speed of 76¼ r. p. m., discharging 235.33 cu. ft. of water per second they developed 300.84 h. p., showing an efficiency of 81.32 per cent, which would make the total possible output of the power house about 16,000 k. w.

COST.

Perhaps the greatest obstacle to a fair comparison of electric current produced by water power, as against the same current produced by steam, is the first cost. In the former case, especially if a large water power is to be developed, the expense of the whole installation, such as dams, head and tail races, etc., has usually been made at the commencement, while perhaps only a fraction of the power thus obtainable is at once used, therefore making a very much larger capital cost per unit, than with a steam plant, which need only install the power necessary for immediate demand and continue increasing or adding thereto, as the demand therefor offers.

In this case it was necessary to spend about one million dollars in hydraulic development. This million dollars is able to furnish over 20,000 h. p., whereas it will be some time before we will be able to convince the public of the advantages to be derived from the use of electricity, which is no easy task, as anyone familiar with the subject will testify.

The 5,000 h. p. from a commercial point of view, will have for



DIVISIONS 3 AND 4 OF MAIN DAM SHOWING POWER HOUSE AND TURBINE SETTINGS.

nected in series of six, by gearing, to a horizontal shaft, at the end of which a generator is directly connected. The completed power house will contain 12 such sets. The arrangement is shown in the accompanying illustration.

Of the total installation, 48 wheels are already in place, and the power house, head race, tail race, and dams are completed.

ELECTRICAL EQUIPMENT.

Each dynamo house will contain four three-phase General Electric alternators, wound for 4,400 volts at full load, and two direct current exciters at 120 volts. There will be in the total installation three such dynamo houses, containing in all 12 dynamos and six exciters, each exciter being capable of exciting four machines. Each dynamo house will have its own switchboard, of blue Vermont marble, of the very latest design, so arranged that each circuit may be operated from the switchboard of either power house. The floors are of slate and the building of solid brick. The current is generated at 4,400 volts, avoiding the use of step-up transformers, is transmitted over bare copper wire strung on iron poles to the city of Montreal, a distance of about five miles, to the sub-stations, where the pressure will be lowered to 2,300 volts, and by means of sub-station switchboards, subdivided into the desired units and distributed partly through underground conduits, and partly by overhead construction, throughout the city of Montreal, and its suburbs, where there is a population of over 300,000 people, offering a fine market for light and power. Of the total equipment, one-third is already installed.

TOTAL POWER.

The wheels were tested at the Holyoke testing flume, on April 16 and 17, 1897, and developed at full gate, as follows: With a

the present at least, to be charged with all the expense of the hydraulic development of over 20,000 h. p.

In estimating the cost of producing power from the Lachine Rapids, the writer does not take into consideration the cost of distributing power, for this would be the same in either case, whether the prime mover was a water wheel or a steam engine. He will therefore confine himself to the cost of developing water power and delivering that power on the bus bar at the sub-station, exclusive of the generator. He will add the cost of the transmission line from the source of power to the sub-station in the city, because this is directly attributable to water power plants, as it would not be necessary in the case of a steam plant, unless it were for transmitting power from a coal mine to a city or following the practice laid down by the Brooklyn Edison Company, in locating its power house at a point convenient for obtaining coal and water at reduced prices, using high tension transmission and converting by rotary converters, at various substations. There will also be included, the step-down transformers to reduce the pressure to that required for local distribution, about 2,000 volts. He will also charge the water power with the drop or loss in power from the rapids to the sub-station.

The writer therefore considers, in justice to the Lachine Rapids plant, it would be necessary to give, first, the cost per kilowatt per year, for the portion of the plant at present installed and connected to generators ready for operation, and second, what the cost will be per kilowatt per year, when the whole water power development is in operation.

1. The total cost of water rights, dams, hydraulic machinery, power house, transmission line, step-down transformers, etc., is \$957,200.

The power developed is 4,000 k. w. at the generator. Allow-



ing 10 per cent loss, there will be delivered at the sub-station bus bar, 3,600 k. w., which is equivalent to \$263.83 per kilowatt, capital cost. This at 6 per cent would be equivalent to \$15.95 per k. w.

Depreciation on \$300,000 which will more than cover the cost of that portion of the plant subject to depreciation, rated at 5 per cent and spread over 3,600 kilowatts would be equivalent to \$4.17 per k. w.

Operating expenses, including labor, repairs, insurance, etc., amount to \$10,275 per annum, which is equivalent to \$2.85 per k. w.

This makes a total cost on a 24-hour day basis \$22.97 per k. w. per year.

2. The total cost per kilowatt with the whole water power plant in operation. Before giving these figures, the writer would like to explain that the figures herewith quoted, are reliable for the cost of the completed plant, inasmuch as the same is at present under contract with reputable firms, the Lachine Rapids Hydraulic & Land Company, having a limited time, in which to order the works completed.

The total capital cost with 72 wheels installed will be \$1,113,273. The power developed, after deducting all losses will be 13,500 k. w. at the sub-station bus bar, equivalent to \$82.46 per k. w. capital cost, which at 6 per cent represents \$4.95 per k. w. per annum.

Depreciation per kilowatt will equal \$1.68 per k. w.

Operating expenses, including labor, repairs, oil and waste and insurance, if taken upon the same basis as already existing, will amount to \$20,453, equivalent to \$1.51 per k. w.

This makes a total for a 24-hour day \$8.14 per k. w. per annum.

It will be noticed that the operating expenses, as well as the depreciation, per k. w. in the latter case is very much reduced and it is a remarkable feature, how constant the operating expenses are, even at present, being practically the same with full load as with no load.

In connection with these figures, it might be stated that coal used in Montreal and vicinity, is what is known as Nova Scotia coal and costs \$3.50 per ton for run of mine.

The writer would also draw your attention to the fact that the capital cost cited in each of the foregoing cases, includes money paid for real estate, of which the company owns over some eight million feet fronting on the Rapids, intended at some future date to form the site of a suburban town and which it is hoped and expected, will return the money expended in developing the water power above referred to.

### CONCLUSIONS.

From the foregoing, the writer trusts that he has shown that where reliable water power can be obtained within reasonable distance from power centers, it can be made to produce cheap electric current to say nothing of the great advantages the city must derive therefrom, not only commercially, but viewed from a sanitary standpoint as well, as the use of electric power thus generated, is the best smoke consumer yet invented.

### Analysis of the Cost of the Generation and Distribution of a Unit of Electricity.

BY CALVIN W. RICE.

It is the intent of the paper to show what has been done, what is being done, and what is therefore possible, rather than to give theoretical tables. It is the intent also to show the advantage of watching each one of the various items which go to make up the total cost, and, by pointing out the proportions of each to the whole, to aid one in the discovery as to which particular items are disproportionately large in his plant.

Before taking up the consideration of the cost of operation of a plant we should first consider the plant itself.

In America the variation in the investment per kilowatt is \$200 to \$750 per kilowatt capacity installed. In a few cases the figure is below \$200, and in a few as high as \$1,000; but in the great majority of cases the cost is below \$400.

In this respect American practice is ahead of that of Great Britain and the Continent, where the majority of plants have a total investment of over \$500 per kilowatt installed.

The figures on some railway plants in Chicago give the cost to be less than \$75 per kilowatt. I think these figures refer to stations alone, whereas the corresponding values for lighting plants include distributing systems also.

The importance of keeping down the investment per kilowatt need not be emphasized.

The principal items that go to make up the total investment are real estate, steam or water power plant, electric plant distributing system and minor details.

In the first item we naturally find a great variation in the different plants. In country towns it runs as low as \$25 per kilowatt, and in cities as high as \$150 and over. In other words, there are some plants where the investment in real estate alone is greater per kilowatt than the entire investment is in others.

The investment in steam plant varies from \$20 to \$60, with figures on the electric plant slightly greater.

It is needless to say that the location of the plant ought to be considered with reference to all influences, each considered separately and reduced to a common method of comparison, i. e., the dollars and cents value per year of each consideration.

For instance, in a large city which I visited a couple of weeks ago I observed a new station being erected not over 1,000 feet from a river, yet five or six 1,000-h. p. non-condensing engines were being installed. It is reasonable to assume that the convenience of that site to the main street of the city had a greater dollars and cents value than the consideration of condensing plus the difference in value of the land, as the company had the option to sell the present power site to the government and to buy a river site for less money.

In buying the steam and electric plant, however, it is essential to consider reliability above every other consideration. In emphasizing this point to make it the end sought while considering the merits of boilers, engines, water wheels or generators, it should be viewed in its broadest sense. It is of assistance in examining bids on electrical apparatus or engines, to compare the prices per pound, and weight in pounds per kilowatt or horse power, and in considering boilers, heating surface and pounds per horse power, as well as price per pound.

The various methods of rating apparatus and of stating ability to stand overloads are very confusing to the purchaser, and comparisons by pounds develops features not otherwise noticed, but worth considering carefully.

Having decided whether or not it is economical to use simple compound or condensing engines, decision as to the boiler pressure will follow as a matter of necessity, and will in turn decide in part whether return tubular or water-tube boilers will be advisable. The price per horse power of boilers is now not widely different.

The advantage of direct connecting over belt or rope drive is now recognized, so very little need be said. The amount of saving has been very carefully sought by Mr. Crompton, and in 23 of the largest English works the results have been tabulated as follows:

Works.	COMPARISON OF FUEL USED.				Descript. of plant.
	Cost of fuel per unit sold.	B. T. U. in fuel per unit.	Efficiency of distribution.	B. T. U. per unit geo.	
Newcastle & Dist. A	1.60	310	70	218	Steam turbine.
Leeds.....B	2.46	300	66	200	" " "
Bonleymouth.....C	3.62	232	60	160	" " "
House to house.....D	3.85	255	65	175	" " "
Newcastle-on-Tyne E	1.28	302	66	173	" " "
Metropolitaa.....F	3.60	232	66	153	Mixed system
Eastbourne.....G	2.84	180	60.8	109	Alt' Rp. Dr.
Exeter.....H	2.70	135	66	89	" " "
Average of B, C, D & F		245		161	
		MIXED SYSTEM.			
City of London.....I	2.48	172	82	141	Mixed sys. dr.
Chelmsford.....J	1.92	148	76	112	" " "
Average.....I & J		159		125	
		CONVERTED CONTINUOUS.			
Chelsea.....K	2.22	142			Dyns. driv. dir.
Oxford.....L	1.40	88.5	62	55	" Rp. Dr.
Average.....K & L		115		72	
		DIRECT SYSTEM.			
Preston.....M	2.30	315	93	235	Dynam's driv. dir. by dbl' act. eng.
Liverpool.....N	1.90	186	75	153	Single act. "
Birmingham.....O	1.76	183	75	149	" " "
Charing Cross and Strand.....P	2.26	147	90	132	" " "
Hove.....Q	2.52	147	82	120	" " "
St. James and Pall Mall.....R	1.74	116	95.4	110	" " "
Bradford.....S	1.32	119	88.7	110	" " "
Brighton.....T	1.84	117	89	100	" " "
Keosington.....U	1.74	116	86.5	94	" " "
Westminster.....V	1.56	104	88	92	" " "
Kulgisbridge.....W	1.28	84	91.5	78	" " "
Average.....N to W		133		112	
Ideal Works.....	0.54	35.4	90	22.6	

\*The table shows that the cost of fuel averages 4% higher where the dynamos are rope-driven than where the dynamos are direct-driven by high-speed engines.

Great stress is nowadays put upon high efficiency, and while this is important, reliability should be the principal feature.

In the present day of good design there is at best little to be gained in absolute efficiency but the cost of energy, and the popularity of electric light and power will be very much affected, according as it is reliable.

Good regulation in the station is more important than high efficiency. Good regulation in the station means ability to use high efficiency lamps.

The use of 50-watt instead of 58-watt lamps means a saving of 14 per cent directly in the lamps and in the copper losses. Relatively this increase in efficiency is much greater than is possible in any of the various types of boilers, engines or generators. Therefore the governing of the engine from no load to full load, and the regulation of the generators with load thrown off and on, should be carefully determined.

The value of accessories in the reliability of the plant and the reduction of labor and attendance is important. These accessories are as follows:

- I. Feed-water appliances:
  - (a) injectors.
  - (b) steam pumps.
  - (c) electric pumps.
- II. Boiler appliances (steam or electric):
  - (a) forced draught.
  - (b) mechanical stokers.
  - (c) super-heaters.
  - (d) coal handling and storage.
  - (e) ash conveyors.
- III. Cranes:
 

Mechanical or electrical.
- IV. Auxiliary electrical apparatus:
  - (a) boosters.
  - (b) station motors.

It is not ever advisable to drive the exciters from a motor taking current from the main generators on account of fluctuations being multiplied.

But under certain conditions the feed pumps, coal and ash handlers, overhead cranes and stokers may be driven with success and economy by either alternating or direct current electric motors.

Electricity as delivered at the switchboard is generated with economy and can be used more advantageously than steam. \* \* \*

The price charged per unit is made up of cost and profit.

The cost may be subdivided as to

I. Generation and distribution; II. Maintenance; and III. Management.

It may again be divided into (a) material and (b) labor; (a) representing (1) fuel, (2) water and (3) supplies; (b) representing (4) wages and (5) superintendence.

II. Maintenance is made up of (6) material, (7) wages and (8) superintendence, and

III. Management, may be subdivided as to (9) directors, (10) salaries and (11) expenses.

As we compared total cost of plant per kilowatt and found it on the average to be under \$400, calculations as to cost of operation of plant per unit output per year gives that figure to be, on the average, under 50 cents. That is, on the average, it requires 50 cents worth of plant to generate and distribute one kilowatt per year. \* \* \* \* \*

There is another point to be learned, namely, the percentage of units generated which are unaccounted for. This percentage is even greater in gas companies, and it is interesting to watch the reports from year to year and to see the improvement in this matter. The Massachusetts report of all the gas companies of that state gives the exact number of feet unaccounted for in each company. These items, added together, in 1897 amounted to 285 million feet. One gas company lost 36 per cent of its output, and quite a number over 20 per cent.

The largest percentage of unaccounted-for units in the English electric stations generating over a million units appears to be 12½ per cent. Quite a number having an output of 500,000 units have 33 per cent. One station loses 47 per cent.

These figures with respect to electric lighting are not comparable with gas, for the reason that we allow the larger portion of the loss as necessary to the distribution. I have no doubt

but that a great saving may be made in our stations if attention is brought to this feature. \* \* \* \*

In comparing street railway with lighting stations we find that the average efficiency of the lighting is less than half the railway companies', also that the average of these railway stations is above the highest efficiency of the 1896 report, but was equaled in 1895 in the report of one lighting station only.

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## NO FOUR-CENT FARE FOR MILWAUKEE.

May 31 Judge Seaman in the federal court rendered a decision holding invalid the ordinance of the city of Milwaukee compelling the Milwaukee Electric Railway & Light Company to sell six tickets for 25 cents. The court does not go into the question of the power of the city to prescribe reasonable regulations as to rates of fare; this is assumed for the purpose of deciding this case, and the ordinance held invalid because the rate of fare fixed is unreasonable.

The court found that the enforcement of the 4-cent fare would operate to materially reduce the net revenues of the company, and reduce them below the point fixed by equitable and constitutional considerations.

The proposed reduction would deprive the company of property rights by preventing reasonable compensation for service. Confiscatory rates are repugnant to the constitution, and any compulsory rate which will not give an income large enough to meet expenses and yield a fair profit is confiscatory.

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## YERKES ON FRANCHISE EXTENSIONS.

A rather unusual meeting was held at the Palmer House, in Chicago, June 9, under the auspices of the Civic Federation, a self-constituted body to protect the public interests of the city. The attitude of this body has been decidedly antagonistic to the street railway companies. An invitation was extended to C. T. Yerkes, president of the North and West Chicago Street Railroad Companies, to present the street railway side of the argument in reference to franchise extensions. N. A. Partridge first spoke to the audience accusing the companies of corruption in dealing with legislative bodies, stock speculation and false reports by manipulating the book keeping. He favored monopoly and consolidation of all the companies in one city and private ownership and operation of the railways. Mr. Yerkes won the attention and sympathy of the audience by his plea for fair play and investigation. He explained many of the points raised by Mr. Partridge and pointed out the error in many public fallacies. He said that his companies had spent \$8,000,000 in the last four years having faith that the people of Chicago would not call for any legislation that would mean confiscation of this property. Mr. Yerkes was given close attention and generously applauded.

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It is rumored that all the surface street railways in New York are to be consolidated and preparations are being made with that in view. The Third Avenue Railroad Company has received permission to change some of its lines to the underground system and the Metropolitan Traction Company is about to apply for a permit to operate all its remaining lines by the conduit system. It is thought there would be economy in operation to generate the power for all these systems at one station and have the entire management under one head.





and returning, under "in." "Transfers Received" includes all transfers, those that are free as well as those for which a charge is made. The transfers are assorted and examined at the office of the treasurer. "Free" means the number of free riders, such as policemen and firemen on each half trip. "Tickets Received" represents the amount in tickets, counting them at 4 cents each; the sixth of a cent is settled at the office. "Cash" needs no explanation. "Total" represents the amount of tickets and cash and "Total Passengers" represents all the passengers on the half-trip, which when compared with the inspector's report gives a check on the conductor. Passes and employes' transportation are coupon tickets which are treated as transfers.

On the back of Form No. 1, which is a sheet 6¼ in. wide and 8½ in. long, is the record of the number of transfers issued, and a ruled form for entering the names and

ing him the conductors' books (Form No. 1), money and tickets.

The principal receiver adds the returns from the different offices together and makes his report to the treasurer, on Form No. 6, which is 4 in. by 5½ in., entering his money on a bank deposit ticket which is turned in with the report. The treasurer has in his office a book in which the total cards previously mentioned as being filled out by the conductors are entered and the receiver's report must agree with this.

The accounts in the treasurer's office are kept according to the method recommended by the committee of the Street Railway Accountants' Association.

## THE ENGINEERING CHEMISTRY OF BOILER WATERS.

A Paper Read by Henry Leffmann before the Engineers' Club of Philadelphia.

Pure water is an artificial product of the laboratory, and is so difficult to prepare and preserve that its properties can hardly have any practical importance. Natural waters always contain substances in solution and suspension, varying from mere traces to very large amounts. The effects and uses of water are dependent upon the character and amount of the materials present. When the wholesomeness or physiologic effects are to be determined, the important points are the nature and amount of the mineral ingredients and the character of the organic life; but when the applicability of a water to steam-making purposes is to be determined, the action of the dissolved gases becomes important, while the organic matter, living or dead, has no practical importance unless the amount be unusually large or it be exceptional in character. Many other technical uses for water, except that of steam-making, may come under the supervision of the chemist, but they are of less practical moment.

For the study of natural waters it is convenient to arrange them into groups, and although this classification is for use in the determination of the wholesomeness, it will not be amiss to note it. The groups are four—viz.:

*Rain-water.*—Water precipitated from the atmosphere under any conditions, and, therefore, including dew, frost, snow, and hail.

*Surface-water.*—All collections of water in free contact with the atmosphere, whether in motion or at rest.

*Subsoil-water.*—Waters not in free contact with the atmosphere, but percolating or flowing through soil or rock at a moderate distance below the surface, derived in large part, if not wholly, from the rain or surface-water of the district.

*Deep-water (artesian-water).*—Water accumulated at considerable depth below the surface, from which the subsoil water of the district is separated by one or more difficultly-permeable strata.

Rain-water collected in the open country is usually nearly pure, but in cities it may contain much objectionable matter.

Surface-water is usually well adapted for boiler purposes, except for its liability to turbidity. It usually contains only a small amount of dissolved solids and but little carbonic acid.

Subsoil-water, which is that obtained from springs and ordinary wells, is usually clear, and contains notable amounts of solid matter.

Deep-water is variable in character, even with a limited area; and approximately the same depth waters of markedly different characters will be found. Deep-waters are apt to be rich in dissolved solids, but there are many exceptions to this. Iron compounds and sodium chloride are often present in considerable quantity, sometimes so great as to unfit the water for any household or technical use.

The suitability of water for boiler purposes must be considered with reference to the two properties of corroding and scale-forming. These are, to some extent, antagonistic, since the deposit of material on the iron will, of course, protect it. Experience shows that waters of very high purity are by no means always

TRANSFER, CAPITAL TRACTION COMPANY.

badge numbers of the policemen and firemen who ride free, and the time of day when they ride. These are entered each half-trip by the conductor.

At the end of each half-trip the conductor puts his transfers in an envelope, 5 in. by 3 in., on the back of which is a printed form with blanks for entering the train and trip numbers, the time and the number of transfers, the name and number of the conductor. These envelopes are turned in to the receivers at the end of each half-trip; the receiver has a case of pigeon holes (one for each conductor) in which he files the envelopes until the end of the day when he puts a rubber band around them and sends them to the treasurer's office.

Every trip the conductor makes his returns to the receiver, who enters them in a large book, on each page of which are printed duplicates of the conductor's book, and at the close of the day the conductor fills up a card, Form No. 2, and called a "total card." The total cards are given to the superintendent who sends them to the treasurer's office. The superintendent has a case of pigeon holes in which he keeps the transfers and punch to be issued to each conductor. He also keeps a book in which he registers the number of the transfers given to each conductor at the beginning and returned at the close of his day's work, and from this book an improperly issued transfer can be traced to the conductor who issued it.

Form No. 3 is 5 in. by 9 in. with 28 lines, and is used by the superintendent in his daily returns for transfers that are sold for 2 cents each. Form No. 4 is 7½ in. by 12½ in., on which the superintendent keeps his record of the free transfers issued to the conductors in the morning and the number returned at the end of the run.

Form No. 5 is 14 in. wide by 12 in. long, on which each receiver makes a daily report to the principal receiver, send-



the best for boiler use. In general, it may be said that the corrosive qualities are due to the water molecule itself or to the oxygen and carbonic acid present in solution. More rarely, we have organic or mineral acids, and these, especially the latter, are highly objectionable. Organic acids of somewhat indefinite character result from oxidation of vegetable matters, especially the cellulose and lignin of wood-fiber; hence, waters collected from swampy regions, in which there is necessarily much decaying vegetable fiber, may contain organic matter in a corrosive form, practically acid, although perhaps not corresponding exactly to the strict definition of that term in modern chemistry.

The water supplied to Sheffield, England, is derived from peaty moorlands, and sometimes has a strong action on iron. In one stage of the flow the acidity is equal to about  $\frac{1}{2}$  of a grain of sulphuric acid to the gallon. As these acid-like substances are often not volatile, the concentration of the water in the boiler greatly increases the corrosive action. Even when the organic substances are not capable of acting as direct corrosive agents, they may indirectly determine the oxidation of the iron. The laboratory affords us more than one instance of the formation of a body being promoted by conditions favorable to its combination when formed, and it seems possible that any organic matter which is readily converted into acids by moderate oxidation would be capable, under the joint action of free oxygen and a distinctly positive body, such as iron, of forming a soluble iron salt, although neither the oxygen nor the iron alone would accomplish the action.

An important commercial process may be cited as an example of this: Finely divided vegetable matter, such as sawdust, is readily converted into potassium oxalate by heating with caustic potash; and from this product oxalic acid, one of the strongest acids known, may be obtained. Vegetable matter is not converted into oxalic acid by the action of air alone or mild oxidizing agents.

Some years ago, when studying the Anderson process of purifying water, I had occasion to note an action which seemed to be explicable on this theory. A sample of water was received from the neighborhood of Norfolk, Va. It was deeply colored with organic matter. On agitating it with iron-turnings in a partially-filled bottle for a few minutes, a bulky precipitate was formed, and on filtration a colorless water was obtained, tests of which showed that 97 per cent of the oxidizable organic matter had been removed. It seems probable that somewhat similar action would occur in a boiler, and that a material corrosion of the iron would ensue, for in the experiment noted above a notable amount of the iron was converted into ferric oxide.

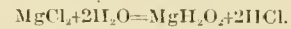
It is hardly necessary here to speak of the injurious action of mine-waters. In most cases they owe their acidity to sulphuric acid derived from the oxidation of pyrites, and exercise a powerful and constant corrosive effect on iron, even in the cold.

I have lately had occasion to examine two waters which have marked corrosive qualities, although they do not show excess of organic matter or marked acidity. They are of somewhat different composition. One contains about six grains of solid matter to the gallon, the other about nine. Their corrosive effect is exerted on other metals than iron; indeed, with regard to both samples, the most serious complaint is that the soldered joints in the lead-lining of the flush-tanks are destroyed. One of the samples was sent with the information that everything was corroded except the copper portion of the ball on the valve-rod. This statement led me to suspect the presence of a copper salt, but none was found. Copper and lead salts will prove very corrosive to iron. The quantitative examination of these waters has shown that in both the amount of magnesium and chlorine is high in proportion to the other solids. This suggests the view that the corrosive action is due to magnesium chloride, as noted below.

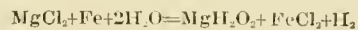
The corrosive action of the soluble chlorides on common metals is well known. Practically only sodium chloride and magnesium chloride come into consideration. Sodium chloride is present in almost every sample of water, but in surface and subsoil-water, unpolluted with sewage, the quantity is usually less than one grain per gallon. In deep-waters the amount is often quite large. Thus, in the well (over 400 ft. deep) on Black's Island, just below the mouth of the Schuylkill river, the sodium chloride exceeds

50 grains per gallon. Such a water would be expected to exert a decidedly corrosive action.

Magnesium chloride is generally considered a highly objectionable ingredient by reason of its liability to a reaction with water, by which hydrochloric acid is formed. It is known that magnesium chloride can not be obtained pure by evaporating its solution in water; the residue will contain some magnesium oxide, while hydrochloric acid escapes. The water takes part in the reaction.



Some experiments that I have made indicate, however, that this reaction does not occur until the solution becomes concentrated. However, we must bear in mind here the principle that has been stated in connection with the effect of organic matter, namely, that the presence of iron may promote the reaction by offering an opportunity for the action of the chlorine. The experiments of evaporating magnesium chloride in glass, porcelain, or platinum vessels do not represent the conditions in practice, and the reaction



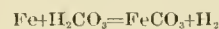
might occur under conditions which would not bring about the former reaction.

To be on the safe side, some chemists have advised that the magnesium and chlorine determined in the analysis should be so expressed as to show the maximum amount of magnesium chloride that could be produced from the water, and thus determine the upper limit of a corroding effect from this source.

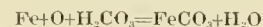
Even supposing we have no substances in the water capable of acting directly on iron, it is not likely that any boiler will escape some corrosion, for commercial forms of metals are not usually homogeneous, and the contact of water containing appreciable amounts of mineral solids will establish a polarization which one portion of the iron will become the positive plate in a voltaic couple and suffer corrosion in consequence.

The gases dissolved in water are usually nitrogen, oxygen, and carbon dioxide; the last is assumed to exist as carbonic acid. Nitrogen is regarded as without effect, but the others are important. Spring-water of high class—that is, containing very little dissolved solids—often produces marked corrosion. Some years ago one of the large trunk-line railroads had much trouble from boiler-corrosion on a division which was supposed to furnish excellent water. The road had a well-equipped laboratory, but the chief of that department assumed that the corrosion was due to free acid. He held to this view stubbornly, and in defense of it had numerous analyses made and considerable volumes of the water evaporated in order to concentrate the acid which was not there. The examination showed that the corrosion was due to the dissolved oxygen, probably assisted by the carbonic acid. The water contained so little scale-forming material that no protecting film was formed on the iron, and hence it was exposed to the direct corrosive action of the water and the contained gases.

The solubility of oxygen in water is greatly diminished by heat, while chemie activity is increased. Hence, the cold water charged with oxygen entering the boiler has this oxygen released from solution and it attacks the iron. The corrosion is, therefore, apt to be most marked at the point at which the feed-water enters. The presence of the free oxygen and its increased activity probably also assists the corrosive action of the carbonic acid. The reaction



is unlikely, but



is not improbable; indeed, it is supposed to occur in some cases in the Anderson process for purifying water.

When the amount of scale-forming ingredients is sufficient to produce a film on the iron, it is protected from such immediate corrosion, and we are reminded of the conditions which occur in the human mouth—the decay of the teeth and the deposit of tartar are antagonistic conditions and do not occur at the same spot.

Two other influences toward corrosion may be mentioned:

Unpolluted waters usually contain but small amounts of nitrates, but waters drawn from shallow wells in populated districts generally contain notable quantities, probably in the form of calcium and magnesium nitrates. These are corrosive salts,

and, as the determination of the nitrogen existing as nitrates is easily made by modern methods, it should not be omitted by the analyst. If the proportion exceeds a few parts per million it should be given consideration.

The fatty oils may lead to the production of corrosive substances. These often contain free acid, and the proportion may be increased in the boiler since high steam decomposes the fats and oils, producing a fatty acid and glycerol. The mineral oils are hydrocarbons and are not subject to such decomposition, and hence are not likely to form acids. In fact they exert rather a reducing action and might restrain corrosion.

Turbid waters should be filtered before being used in boilers. If filters using alum are applied, care should be taken that an excess of alum (or aluminum sulphate) be not used, as decided corrosion might be produced.

The scale-forming ingredients in water are principally the compounds of calcium and magnesium. Usually the amounts of silica and iron are not sufficient to produce marked deposits. Calcium and magnesium exist in natural waters principally in the form of sulphate, carbonate, or chloride, and the amount and character of the scale will depend, to a great extent, upon the form of combination. Magnesium and calcium carbonates are but slightly soluble in pure water, but are rendered much more soluble by the presence of free carbonic acid. This is usually expressed by saying that the substances form soluble bicarbonates, but the term is little more than a form of words. Whatever be the condition, it is well understood that it is disturbed by the removal or neutralization of the free carbonic acid, when all but the small quantity of the carbonate, soluble in the pure water, is precipitated. In the ordinary use of water, the removal of the carbonic acid is brought about by the heating, and deposits of the carbonates promptly take place. The amount of such deposit is, therefore, independent of the concentration which the water suffers.

Magnesium sulphate is freely soluble in water under all ordinary conditions and need not be further considered. Calcium sulphate is one of the most objectionable ingredients in boiler-water. Although often described as an insoluble salt, it is soluble in cold water to the extent of over 100 grains to the gallon. At the boiling-point it is somewhat less soluble, and at temperatures decidedly above this, say 300° F., which corresponds to about 60 lbs. pressure, it is nearly insoluble. Now, it is a well-known principle that insolubility controls chemie interaction. Hence, water containing calcium compounds and sulphates would be expected to form a precipitate of calcium sulphate in such amount as to exhaust one of the ingredients that are needed to form it—that is, until either the Ca or the SO<sub>4</sub> is used up. Possibly the presence of considerable amounts of chlorides or potassium or sodium carbonate would mitigate this condition, but in most instances, I think, it will be safe to apply the same rule that is given for the estimation of magnesium chloride, namely—base the judgment on the maximum amount of calcium sulphate that the water could yield under any condition.

In response to an inquiry, Dr. Dudley has kindly given me an outline of the method used in the Pennsylvania Railroad laboratory at Altoona for the approximate determination of scale-forming ingredients. The total solids are determined in the usual way, the residue is treated with dilute alcohol (50 per cent) and the undissolved matter is designated scale-forming material. The method is found to be satisfactory in its application.

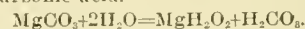
Any condition that promotes the insolubility of the calcium sulphate will, in some measure, represent the effect of heat, and hence the amount of precipitation obtained by adding alcohol to the concentrated water will be of value in determining its incrusting tendency.

Although the various materials which deposit in boilers are often collectively designated as "scale-forming," yet as is well known the different material differs much in the character of the material deposited. The carbonates produce a soft scale, calcium sulphate a hard scale.

E. F. Smith has called my attention to the fact that some manufacturers at Manayunk, Philadelphia, have been obliged to abandon filters requiring alum on account of the marked increase of hard scale which is brought about. This is easily explained: the alum introduces a notable amount of sulphate into the water.

Probably aluminum chloride could be substituted with advantage in these filters.

In that portion of the deposit in direct contact with the hot iron, the precipitated magnesium carbonate becomes converted by the combined influence of the heat and water into magnesium hydroxide and carbonic acid.



Hence many boiler-scales show notable amounts of magnesium hydroxide without necessarily indicating that it is due to the decomposition of magnesium chloride.

Perhaps, at the end of this exposition of chemie principles, you may be inclined to say with the Mikado, "All this is very interesting, but we come upon an entirely different matter." Engineers can not control the laws of nature, and often have no choice of water. The question is then what may be done to remedy the objectionable conditions. Turbidity may be easily remedied by filtration. In the technical uses of water a mere straining effect is needed; the removal of bacteria and the mere opalescent suspended matter is not necessary, hence less care is required in the operation of the filtering apparatus than when sanitary questions are involved. I have already called attention, however, to the danger of the too free use of aluminum salts.

When corrosion is due to free acid it may be easily overcome by the use of alkaline substances, among which caustic soda and soda-ash would be most generally applicable. The corrosion due to the decomposition of the magnesium salt would be benefited by almost any of the methods adopted to prevent scale, which will be considered later. The corrosion due to dissolved oxygen will be materially reduced by heating the feed-water, and also by arrangements for not allowing the water to come directly in contact with any highly heated spot.

The prevention of scale is secured in various ways. The magnesium and calcium carbonates that may be held in solution by carbonate acid are all precipitated by the removal or neutralization of that acid. The former may be accomplished by the heating of the water, or even by exposing it in thin layers to the action of air; the neutralization can be brought about by the addition of some basic substance. One of the oldest methods is the addition of slaked lime, calcium hydroxide, which, by converting the carbonic acid into an insoluble carbonate, precipitates both itself and the carbonates in solution. Caustic soda will also accomplish this.

The precipitation of calcium sulphate can not be so easily accomplished. It is soluble in water to the extent of over 100 grains to the gallon. It does not owe this solubility to any other substance, and it is not much less soluble at the boiling-point. If the precipitation is to be accomplished by heat alone, it must be under decided pressure, as exhaust steam will not produce the same effect as it will with dissolved carbonates. Calcium sulphate being a most objectionable ingredient, much attention has been given to the methods of removing it or preventing it forming hard scale. The older remedies mostly involved the use of organic matters which acted by interfering with the crystallization of the sulphate, and thus rendered the deposit pulverulent or at least friable. Much organic matter, however, in a boiler may cause corrosion or priming, and we find a tendency at the present day to the use of direct precipitating agents, among which may be mentioned trisodium phosphate and sodium fluoride. Both these substances convert all calcium and magnesium compounds into insoluble flocculent precipitates, yielding also highly soluble and non-corrosive sodium salts. They seem to meet the practical issues very well, and are in extensive use.

#### AWARDED TO THE ALBANY CONSTRUCTION COMPANY.

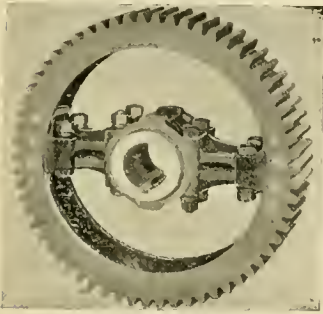
The contract for the construction of the Albany, Helderberg & Schoharie electric railway was awarded, June 2, to the Albany Construction Company. The latter company has agreed to build the 40 miles of railway through the state of New York, at \$10,000 per mile, and to begin the work June 13. The road is a highly desirable one, and the route, through the heart of the state, is likely to be a profitable one.



**DUQUESNE FORGED GEARS.**

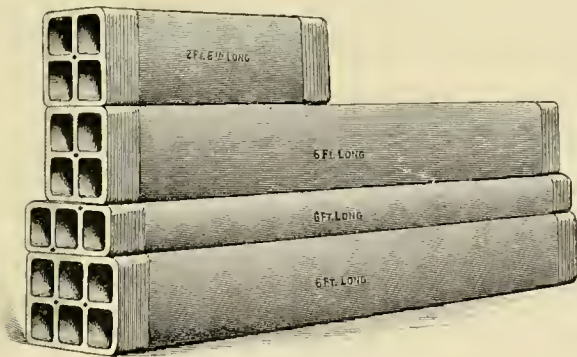
The Duquesne Forge Company, of Rankine Station, Pa., has just placed on the market a complete line of forged steel gears and pinions which are unique in their construction. The method of construction is quite different from anything else on the market and is well shown in the accompanying illustration. The blanks for the rims are first rolled as any structural shape would be, cut into proper length, bent to the desired curvature, and fastened to the cast steel centers by two pins at each end as indicated in the cut. The two halves are then faced, bolted together and the teeth cut. So made the gears are much lighter than the ordinary gear and are free from blow holes. The Duquesne Forge Company will furnish blanks to street railway companies which desire to cut their own gears.

The bolts are readily accessible and a gear can be removed from an axle with any common wrench without difficulty. This type of gear is meeting with favor and the repeated orders from the same customers prove the substantial claims of the makers. The Duquesne Company is represented in Chicago by the W. R. Garton Company.



**UNDERGROUND CONDUITS.**

Whenever the street railways are called upon to lay feeders underground it is necessary to select a conduit which has high insulating properties, is durable, and will not cause abrasion to the cables, is proof against frost, heat, water and acids, and can be easily and quickly laid. The Standard



SALT-GLAZED CONDUITS.

Fire-Proofing Company, of Perth Amboy, N. J., offers such in its salt glazed conduits. They are manufactured of the finest quality of fire clay, properly dried, thoroughly and uniformly burnt and heavily glazed inside and out. As may be seen in the cut the ends of the sections are provided with holes for the use of iron dowel pins, which assist in the alignment and strengthen the joint.

The Warren, Brookfield & Spencer Street Railway Company, of Brookfield, Mass., is now building a new power station and car house.

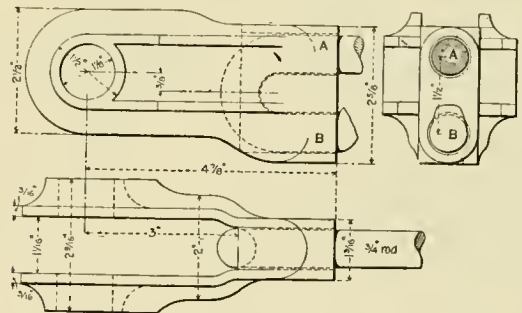
**SERVICE TEST OF STREET RAILWAY BRAKE SHOES.**

The Sargent Company advises us as follows regarding tests made by the Chicago City Railway of the Sargent "Diamond S" and Congdon brake shoes. One car was equipped with two "Diamond S" and two Congdon shoes, the former averaging 20 lbs. and the latter 19 lbs. when new. These were applied on December 10, 1897. On April 28, 1898, the "Diamond S" shoes were removed, averaging in weight 13½ lbs.; average loss per shoe 6½ lbs. On the same date the third pair of Congdon shoes was removed; average loss in lbs. per wheel 20%. Average weight of Congdon shoes removed 12 lbs.; average loss per shoe 7 lbs. The "Diamond S" wore out three sets of Congdon shoes showing a ratio of wear in weight in favor of the former of 3.21 to 1.

On the second car four "Diamond S" shoes were applied and ran from December 10 to May 6, showing an average loss by wear per shoe of 6⅛ lbs. for nearly five months service. The "Diamond S" also gave the better result in stopping the car quickly and smoothly.

**MALLEABLE IRON JAW FOR BRAKE RODS.**

B. Haskell, superintendent of motive power of the Chicago & West Michigan Railway, has designed malleable iron jaws for certain parts of the brake rigging on freight cars, whereby a considerable saving in blacksmith work



JAW FOR BRAKE RODS.

is effected. This jaw was described in a recent issue of the "Railroad Gazette." The end of the rod is first put through the cored hole A in the jaw, and is then heated in the forge and bent so that it can be drawn back through the opening B. The end of the rod is turned down to prevent the jaw from slipping on the rod. In this way brake rods can be fitted up quickly and no skilled labor is required.

**AN ARMY AND NAVY**

Memorandum book is what you have been wanting. The Northern Pacific has it. It contains out of the Maine, Map of Cuba, List of United States and Spanish Naval Vessels, Interior Drawings of a Battle Ship, Illustrations of United States and Spanish Ships, Glossary of Navy and Army Words, Table of Distances, Commanders of United States Ships and Army Corps, List of United States Regiments and Their Commanders and other information very useful and valuable at this time.

The book fits the vest pocket and is up to date. Send Chas. S. Fee, General Passenger Agent, N. P. R., St. Paul, Minn., ten cents and the book is yours.

## PERSONAL.

Paul Seevers, superintendent of the Muscatine (Ia.) Electric Railway Company, resigned June 1.

R. L. Rand has been appointed to succeed William Fisher as superintendent of the Brunswick (N. J.) Traction Company.

E. Kessler, general manager of the Richmond Traction Company, of Richmond, Ind., called on the REVIEW when in Chicago recently.

Thomas H. McLean, general manager of the Toledo Traction Company, was a caller at the REVIEW office when in Chicago the early part of the month.

I. R. Nelson has resigned his position as superintendent of the Milwaukee, Racine & Kenosha Electric Railway. His successor is John Blott, of Cleveland.

A controlling interest in the Citizens' Street Railway, of Mattawan, N. Y., has been purchased by John T. Smith, S. K. Phillips, E. L. Tompkins and W. J. Conklin.

D. A. Belden, general manager of the Aurora (Ill.) Street Railway Company, is quartermaster of the 3rd brigade, Illinois National Guard, with the rank of major.

A. C. Woodworth, president of the Consolidated Car Fender Company, Providence, spent a few days in Chicago the early part of this month, while making an extended western trip.

Capt. Frank S. De Ronde has been given leave of absence from the Standard Paint Company, and has enlisted for the war. He is now in command of a company in camp at Sea Girt, N. J.

E. W. Rockafellow, of the Western Electric Company, who was stationed at Camp Townsend as 1st lieutenant in the 47th New York, has been promoted and is captain of Company M in that regiment.

Ernest X. Le Seure, general manager of the Danville (Ill.) Gas, Electric Light & Street Railway Company, was a REVIEW caller when in Chicago last month, and reported that his company is making extensive improvements and building a line to the new Soldiers' Home.

L. O. Williams, who has for a long time been paymaster for the treasurer of the Lynn & Boston road, has left street railway service to become treasurer of the Ft. Worth & Rio Grande Railroad, with office at Ft. Worth, Tex.

Charles N. Wilcoxon has left Muncie, Ind., and assumed the general management of the Citizens Electric Railway, Decatur, Ill., on June 1. The citizens of Decatur will find Mr. Wilcoxon a progressive officer and pleasant gentleman.

F. C. Armstrong, representing Dick, Kerr & Co., of England, is on a tour of inspection through the United States and stopped for several days in Chicago. On his return home Mr. Armstrong will be the London representative of the company.

George B. Kerper, general manager of the People's Line, Dayton, O., accompanied by Mrs. Kerper, called on the REVIEW while in the city. They also spent some time at Lake Geneva, the guests of Chicago friends, having a fine summer residence at the lake.

At the annual meeting of the Dayton, Springfield & Urbana Electric Railway the following officers were elected: President, Col. Fred. Colburn, Charleston, W. Va.; vice-president, J. S. Harshman, Enon; secretary and treasurer, John G. Webb, Springfield

W. J. Hart, who has been connected for eight years with the street railways of Saginaw, Mich., as manager of the Union and later manager of the Interurban, has resigned and will be the manager of the new Detroit, Lake Shore & Mt. Clemens Electric Railway with headquarters in Detroit.

A. A. Anderson general manager of the Mahoning Valley Railway Company, Youngstown, O., has been chosen manager of the Trumbull Electric Railroad connecting Niles and Warren. The proposed consolidation of these lines will not be effected, though they will henceforth be under the same management.

F. H. Talbot, who was in charge of the mechanical and electrical departments of the shops of the Lake Street Railroad Company, of Chicago, has accepted a position with the Walker Company. He is an erecting engineer, and is now overseeing the equipment of the new motor cars of the Metropolitan West Side Elevated Railroad Company.

F. E. Smith, who, as auditor of the Lynn & Boston Railroad, ranks among the foremost street railway accountants in the country, stopped in Chicago on his return from an extended trip in Texas. He was in attendance upon the sessions of the Illinois Street Railway Association, where he was warmly welcomed and also visited the meetings of the National Electric Light Association.

Albion E. Lang, president of the American Street Railway Association, and of the Toledo Traction Company, has returned from an eastern trip of inspection during which time he spent several days at Old Point Comfort. It is not expected that the war will have any effect on the time or place of the annual convention which meets in Boston early in September. Mr. Lang says all the indications point to the largest and best convention in the history of the Association.

W. L. Ferguson, who has been closely connected with the street railway interests of Decatur, Ill., for the last 15 years and manager of the consolidated system since 1892, resigned on June 1, to become general manager of the Richmond & Eaton Traction Company, which is to build an electric line from Richmond, Ind., to Eaton, O. The employes of the City Electric Railway Company, where Mr. Ferguson has been for so long, presented him with a handsome cane as evidence of their good wishes and kindly feelings. At the recent meeting of the Illinois Street Railway Association, Mr. Ferguson read a paper on "Collection of Fares and Checking Employes."

R. C. Brown resigned his position as superintendent of the Halifax Electric Tramway to become assistant chief engineer of the Metropolitan Traction Company, of New York, and has been succeeded by Fred A. Huntress, who was his assistant. When Mr. Brown's resignation was accepted the directors adopted a resolution reciting that his management had "resulted in the installation of a system of electric lighting and tramway service in the highest degree efficient, which efficiency is due in a very large measure to the ability and competency of Mr. Brown," and the president and secretary were appointed a committee to present him with a testimonial on behalf of the company.

## OBITUARY.

Charles B. Pratt, president of the Worcester (Mass.) Consolidated Street Railway Company, and ex-mayor of Worcester, died at his home on May 10. Mr. Pratt was prominent in banking and insurance circles.

John J. Shipherd, a well known Ohio street railway operator, died suddenly at his home in Cleveland, June 1, of stomach trouble and bronchitis followed by heart failure. At one time Mr. Shipherd was interested in roads at Columbus, Ft. Wayne, Ind.; the Cleveland City and several others, and was understood to be worth a million dollars. All his property, however, was



lost during the recent financial depressions, and left him hopelessly in debt. His business reverses have weighed heavily upon him, and probably are chiefly responsible for his failing health and death.

## NEW PUBLICATIONS.

A supplement of essential information concerning the United States Navy has been published under the name of the Scientific American Special Navy Supplement, by Munn & Co., 361 Broadway, New York. A historical sketch is given of the birth and growth of the new navy, from 1883 to 1898, together with 90 illustrations of our ships, all of which are accurately classified and described. Many of the pictures are half tones and wood cuts. The supplement is handsomely bound, and may be purchased, by mail, for 25 cents.

"Coal Catechism" is the title of a recent work by William Jasper Nicholls, M. Am. Soc. C. E., published by the J. B. Lippincott Company, Philadelphia. It comprises 218 pages, with index; 12-mo. Price \$1.50. The author states in the preface that the book is intended "for that great number of intelligent readers who have no technical training, and yet who prefer to seek knowledge by reading special subjects rather than fiction." In justification of the catechetical form used he says no better method has been devised for imparting a thorough knowledge of a subject, especially to those young students in our schools and colleges who desire special instruction, or to those who have not received the necessary training for systematic study. In all there are 20 chapters dealing with the origin, geology, history, geography, production, classification, development, preparation, transportation, properties, etc., of coal, and the whole constitutes an elementary but comprehensive handbook of the subject. The typographical work is good and the book is attractive in appearance.

## BUFFALO TRACTION COMPANY TRANSFERRED.

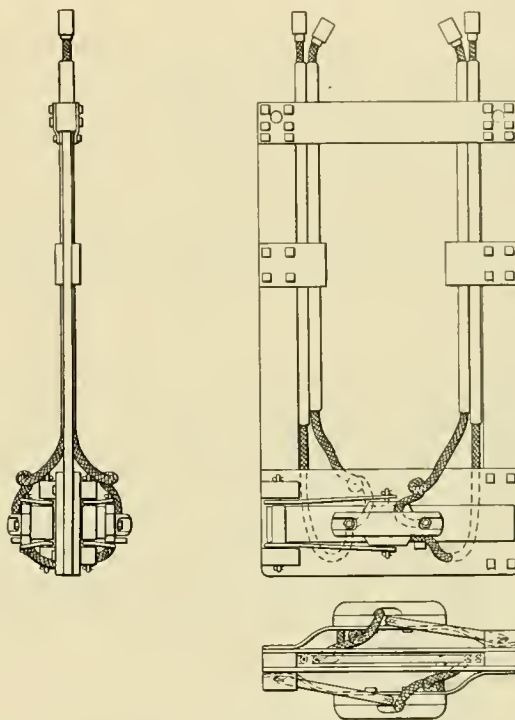
The Buffalo Traction Company has changed control, it being claimed by some that the Buffalo Railway Company either directly or through some of its heavy stockholders as individual purchasers of Traction stock now holds the helm. General Manager Littell in the local papers positively denies that his company is the purchaser, and states that with the 4-cent fare hung around the neck of the Traction, his company could do nothing with the property. If the two properties could be united under the management of the old company, it would be a most desirable thing both for the roads and the public, for transfer privileges would undoubtedly be granted if the city council will raise the Traction's 4-cent fare to 5 cents, which it should be very glad to do.

## WILL ENTER WASHINGTON.

The Chesapeake Beach Railway is now all but completed from the District of Columbia's line to Chesapeake Beach, and will gain an entrance into Washington through an arrangement made with the Capital Traction Company. The Chesapeake Company has leased the Alexandria branch of the Baltimore & Ohio road, and has arranged to run its cars over the tracks of the Capital Company to the navy yard gate. President Otto Mears, of Denver, Colo., has announced that the third rail system will be used for the passenger line. A power house will be built at Patuxent, and \$1,500,000 expended on improvements at the beach to make it one of the finest resorts on the Atlantic coast.

## NEW CONTACT SHOE FOR CONDUIT ROADS.

In the operation of the electric conduit railways in Washington it was found that some alterations could be made in the traveling contact or current collector to insure better operation. G. B. Coleman, general manager of the Metropolitan Railroad Company, and J. W. Duggan designed and patented the form of contact shoe here shown. It was found that if the lead wires were inclosed in fiber strips the insulation became affected by dampness and a short circuit was liable to occur. In the new shoe the insulated wires are exposed so that the insulation will quickly dry out. A special feature is that there is a duplicate set of main leads



CONTACT SHOE FOR CONDUIT ROADS.

which can easily and quickly be connected should the first pair be burnt out or damaged from any cause.

The figures show the front and end elevations of the contact. The main leads extend down the vertical bars and are held firmly in place by insulated tubes which are secured to the frame by U-shaped clamps. The attachments on the upper end of the wires are for connection to the car cables. The lower ends pass through recesses in the contact blocks and are fastened by binding posts, counter-sunk in the contact blocks. The contact blocks or shoes are fastened to fiber blocks and these are pivoted to two oppositely disposed arms and held in position by springs.

The present plans of the New York City street railway companies contemplate the banishment of the horse within the next two years.

The New Castle (Pa.) Traction Company has let the contracts for building an extension to its car barns. Eight new summer cars have just been purchased from Jackson & Sharp.

## FOREIGN FACTS.

Between Haspe and Gevelsburg a light electric railway will be built by the Hagener Strassenbahn Aktien Gesellschaft of Hagen, Germany.

George White, managing director of the Bristol Tramway & Carriage Company, was recently elected president of the Bristol (Eng.) Stock exchange.

An electric tramway will be built in Cognac, France. Manufacturers should address M. Jules Brisson, Maire de la Ville de Cognac, Charente, France.

Barcelona, Spain, hopes to have the electric cars in operation by the coming summer. Permission to equip the Ensanche line with electricity is also sought by the Barcelona Tramways Company, of London, Eng.

A light electric railway will be built at Dortmund, Germany, to operate in connection with the street railway. The line will carry passengers between Dorstfeld and Lutgendortmund. Plans have been prepared by the Allgemeine Lokal & Strassenbahn Gesellschaft.

Twenty American electric street cars were recently delivered in Berlin and 100 more have been ordered. They are required immediately and the order was therefore placed with an American firm that was able to deliver them in Berlin at the same price and in about one-fourth of the time required by German manufacturers.

The street railways of Marseilles will soon be extended till the city shall have 84 miles of track, and all the roads are to be equipped with electricity. A power station, for the generating of an 8,000 h. p. force may be erected, and other improvements made to place Marseilles on an equality with Paris in point of rapid transit.

The electric tramways now under construction in Cork, Ireland, are due to be in service July 1. The power plant includes three Babcock & Wilcox boilers and three McIntosh & Seymour side crank tandem compound engines. There are to be 18 double-decker cars each to be fitted with double motor equipments and series parallel controllers.

The rapid building of railroads in China is creating a demand for all sorts of railroad equipments, and American firms are getting a majority of the orders. A firm in New York recently shipped over \$5,000 worth of machinery to Shanghai. The Canada Manufacturing Company has shipped to Shanghai one pair of car wheels as samples.

The Mexican Electric Tramways Company, Limited, has been registered in London with a capital stock of £500,000, for the purpose of building and maintaining rail, tram and other roads, telegraphs and telephones. Two of the stockholders are W. Martin, Avondale Manor Road, Richmond, and H. W. Brown, 79 Highland street, Beckenham, near London.

The city of Mainz, Germany, will operate electric railways, entirely abandoning the horse car system. Two new systems are to be installed, on one line the storage and on the other the overhead trolley. The South German Railroad Company is arranging with the state authorities to extend its line. This company will establish a road connecting Mainz with Wiesbaden, and another from Mainz to Eltville.

Theophilus Liefeld, United States' consul at Freiburg, Baden, Germany, writes that an electric railroad system and central power station for electric light and locomotive power will probably be built immediately in that progressive city of 55,000 inhabitants. The chances of American manufacturers in the field, he says he believe to be unusually good. Bids should be addressed to the committee on underground structure, Freiburg, and delivered before July 1.

It is predicted by Hugo Donzelmann, United States consul to Bohemia, that that most productive state in the Austrian Empire will soon be modernized by systems of electric railways to comprise many city and interurban lines. The horse car line in Prague is to be equipped with electricity and extended, and the city of Pilsen is to be furnished with an electric railway. The consul affirms that the new field will be one of profit to American manufacturers.

The Compagnie Generale des Omnibus, in Paris, France, will meet the overpowering competition of the new electric railway systems of Paris, by the establishment of mechanical traction on a first installment of 15 tramway lines, so selected that the total expense will not exceed 25,000,000 francs (\$5,000,000). It is further offered to apply mechanical traction to a second installment of 10 lines if the city of Paris will pay the principal of an issue of bonds to the extent of \$3,000,000.

Three electric railways are projected in the vicinity of Hiogo (Kobe). A line will be built from Kobe to Amagasaki, 15 miles distant by a company with \$249,000 capital. Another line is to be built between Amagasaki and Osaka, and will be five miles long, supported by a capital \$149,900. Address Mr. Shinyemon Konishi, of Itamicho, Kawabe-gun, Japan. The third line is to run from Kobe to Armina, 15 miles. The company has a capital of about \$150,000. Address Mr. Ki-Ichiro Naka, of Arino-mura, Arima-gun, Japan.

At a recent meeting of the Channel Bridge Company, in Paris, M. Thevenet le Boul, chief engineer of the Ponts et Chaussees, explained a new method proposed for crossing the channel between France and England. The plan consists in rolling on a bridge submerged to the depth of 15 metres below low-water mark, an immense platform emerging above the water. It is to be propelled by electricity and capable of carrying four railway trains. The Compagnie de Fives-Lille has made a careful study of the project and has expressed a belief in its practicability.

American manufacturers feared, at first, that the existing war between the United States and Spain would have a disastrous effect as regarded certain large foreign investments in which considerable capital was involved. The danger threatened the manufacturers of electrical railway materials more than it threatened others. The steamer Etruria recently brought satisfactory reports concerning England's confidence in the United States, and the danger of war as affecting the American market is averted. It is expected that more English contracts are soon to be awarded for execution in America.

The Dublin United Tramways Company will accomplish the substitution of electricity for horse traction upon many of the tramways in Dublin, and the rebuilding and extension of the lines that adhere to the old system. The Clontarf line, which is already run by electricity, will be extended. Horses are being displaced by the electric system on the line from Haddington road to Nelson's Pillar, and thus an electric tram service is being established from Dalkey to Dolymount, a distance of 14 miles. This work will be finished within two months, as will the line through Pembroke Township. It is estimated that these improvements will cost \$360,121.

American manufacturers will equip a new storage-battery traction system in Ostend, Belgium. This city is a residence of the king, and a fashionable resort, but has never had a street railway system. The generating plan of the projected railway will consist of a 60 h. p. compound high pressure engine, connected with a Westinghouse multipolar dynamo of 38 k. w. capacity, making 600 revolutions a minute and producing a current of 280 volts. Storage batteries will equip the cars, and a run of 40 miles can be made before recharging is necessary. It will require two hours to recharge the batteries. A complete Westinghouse system, with switch boards, will be placed in the generating station. The cars will run at a speed of from 10 to 12 miles an hour in town, and from twenty to thirty miles an hour in the country.



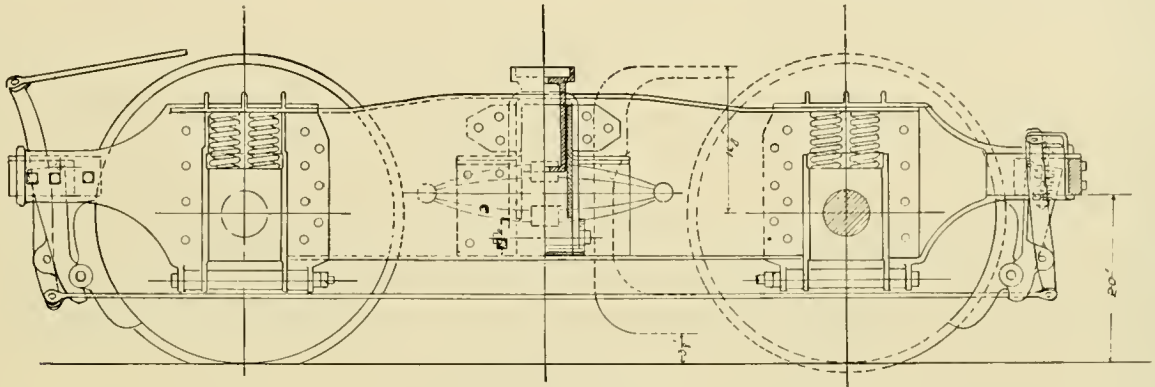
**NEW ELECTRIC PASSENGER COACH TRUCK.**

W. A. McGuire, president of the McGuire Manufacturing Company, Chicago, and John W. Cloud, have patented a pressed steel truck for steam and electric passenger service. The McGuire Company controls its manufacture and sale for street railways.

The truck throughout is of steel, excepting the brake shoes. The sides and bolster are made from heavy boiler plate flanged steel. The swinging bolster is of low carbon

bit of room between the axles and the transoms, so that there is not an unoccupied space of two inches in any part of the interior of the truck. In the case of the Alley Elevated and Brooklyn Bridge all the springs are carried upon the outside of the frame, on or under the equalizers, while in the Cloud truck it should be noted all the springs are carried on the inside of the frame, with the exception of those shown in the cut, over the journal boxes, and no equalizers are used.

The truck has gone into use very rapidly in steam railway service, several thousand having been put into use last year. It is claimed for them that they are the strongest trucks in

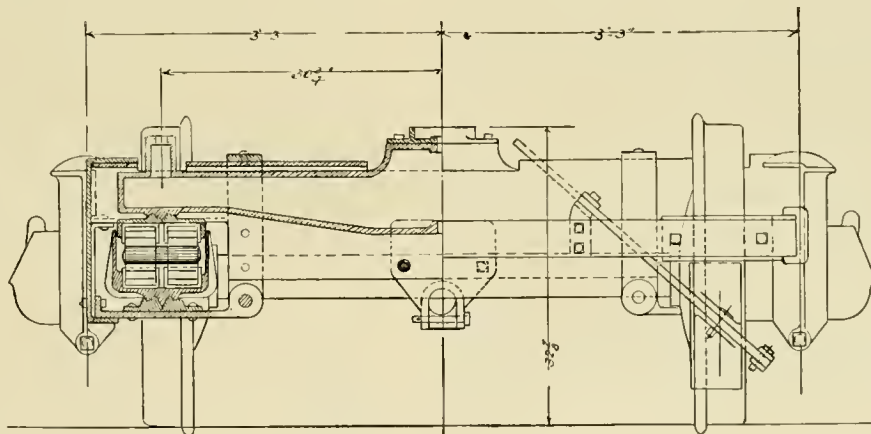


SIDE ELEVATION OF MCGUIRE-CLOUD TRUCK.

cast steel, and the truck is specially designed to meet the heaviest requirements of modern service. The patented points cover the method of mounting the springs over the journal box outside and inside the frame. The rocker housing, which carries the elliptic springs and serves the same purpose as a swing bolster, or, rather, permits the bolster to rock laterally with a motion that is claimed to be easier than the old swing hanger style. The elastic brake hanger also

use, and, while they are only 5 ft. 6 in. wheel base, they ride as easily as a six-wheel sleeper coach truck.

This truck is well adapted to meet the requirements of steam railroads that propose introducing electricity into their suburban service. The long experience of Mr. Cloud and the McGuire Manufacturing Company well fits them for designing a truck of this kind, and their latest production should find a ready place in the market.



HALF-SECTION AND HALF END ELEVATION.

combines the release spring and is an absolute preventive of kicking brakes, which is so objectionable in a passenger coach. It will be noticed that the position of the elliptic springs is quite unique in this, that the support upon which they rest is suspended from the transom and takes up all the space between the wheels on either side of the truck, this being necessary in electric railway practice to make room for the motors. The trucks built by the McGuire Manufacturing Company for the Alley Elevated and Brooklyn Bridge are of the same wheel base, and the motors take up every

**OFFICERS OF THE NORTH JERSEY.**

At the regular meeting of the North Jersey Street Railway Company, which, as noted in our April issue, has leased the properties controlled by the Consolidated Traction Company, of Jersey City, the following officers were chosen: President, E. F. C. Young; vice-president, David Young; secretary, Wilbur F. Johnston; treasurer, E. N. Hill; auditor, E. D. Hibbs. The Consolidated Traction Company turned over its property on June 1.

## ECHOES FROM THE TRADE

The John Stephenson Company has received an order from the Brooklyn Heights Railroad for 70 closed cars for fall delivery.

The Baltimore Consolidated Railway Company has purchased 20 new cars of the Brownell Car Company, which are being fitted with trucks built by the Baltimore Car Wheel Company.

James H. Harris, Chicago agent of the Heine Boiler Company, has sold to the Toledo Traction Company two boilers of 574 h. p. each, for addition to its plant; boilers to be delivered by August 1.

The Cramp-Hoadley Company, New York, agent for the Green-Wheelock engine, has issued a descriptive catalog showing the valve gear in detail and a number of large installations, including street railway plants.

The Toledo Traction Company has ordered 17 closed cars, with 20-ft. bodies and vestibuled on one end which will make a handsome addition to the equipment. These cars will be mounted on the trucks designed by C. E. Moore, master mechanic of the Chicago City Railway.

The Standard Paint Company, of New York, is doing a good business in its P. & B. compounds, tape, varnish and ruberoid motor cloth. These are widely used by the manufacturers of street railway apparatus and in the repair shops of many street railway companies with entire satisfaction.

The Joseph Dixon Crucible Company, of Jersey City, sent out its monthly calendar for June calling attention to the merits of Dixon's silica graphite paint which is recommended as equally useful for metal and woodwork, trolley poles, bridges, stacks, boiler fronts, and iron construction work in buildings.

The firm of Waterlow & Sons, London, has been incorporated with \$750,000 capital for the manufacture of street cars and rolling stock of all kinds for electric steam, gas, oil and horse railways. The work will be located at Preston and in future tramway work great efforts will be made to secure home orders.

The Wheeler Reflector Company, 18 to 24 Washington street, Boston, advises us that it is meeting with much success in selling the dash headlights which have been described in recent issues of the Review, many orders, both new and repeat, having been received from street railways in various parts of the country.

The Augusta Electric & Construction Company has recently been organized to carry on an electrical supply business at Augusta, Ga. Mr. McDonald, formerly the manager of the local telephone exchange, is general manager, and B. R. Mitchell, who has long been in the supply business, is superintendent of construction.

The Christensen Engineering Company, of Milwaukee, has completed arrangements with R. W. Blackwell, 39 Victoria street, Westminster, London, S. W., to act as agent for the company in the United Kingdom. The Christensen air brakes have a world-wide reputation and with the activity in tramway matters in the British Isles a good business is anticipated.

The American Electrical Works, of Providence, R. I., which may always be relied upon to conceive something appropriate, as a souvenir of Memorial Day sent to its friends a fine steel plate portrait of Abraham Lincoln, and as a most appropriate sentiment of the day the immortal address delivered by him at the dedication of the National Cemetery at Gettysburg.

A party including Messrs. Lockwood and Smith of the Anacostia road, Washington, D. C.; B. R. Stare, Sherman, Texas; E. D. Du Bois, Chicago, and a REVIEW representative, inspected the new Patton motor which has since been shipped to Chattanooga. A successful and satisfactory run of about ten miles was made, and two loaded freight cars switched to demonstrate the power.

In an attractive pamphlet from the R. Woodman Manufacturing & Supply Company, of Boston, are described the Bates numbering and line dating machines. The numbers run from 1 to 99,999 and there are four different styles of type. The line dating machine gives the month, day and year for nine years. The machines are attractive in appearance, durable and convenient to operate.

E. R. Richards, first lieutenant First infantry, National Guard of Missouri, the representative of the J. A. Fay & Egan Company in St. Louis having been called out with his regiment, John B. Temple has been sent from Cincinnati to take the place vacated by Mr. Richards in St. Louis, and Phillip J. Fraker has been called from Buffalo to Cincinnati to take the place vacated by Mr. Temple.

The new South Bend Street Railway Company just purchased the South Bend Street Railway and the South Bend & Mishawaka Railway, which is to be the nucleus of a very large system, and it has decided to use the McGuire standard solid steel frame truck on all lines, and has placed the order with that company for the first installment. The competition for this part of the equipment was very strong.

The Electric Storage Battery Company is issuing about twice a month circulars describing installations of chloride accumulators in central stations for trolley regulation, in isolated plants, etc. These circulars give minute details of the method of installing and operating the batteries, and of the results being obtained from them. The circulars may be obtained upon application to any of the offices of the company.

The Simonds Manufacturing Company, of Pittsburg, reports an excellent spring trade and that the shop has been running overtime for many weeks; in addition to the regular work on gears, pinion, bearings, and other railway supplies the company has been doing much special work of large design. It has built a number of wheel grinding machines and is now building some special work for several large orders.

A circular has been received from the J. G. Brill Company describing and illustrating sprinkling cars for street railways. For the standard a tank of 2,500 gallons capacity is used substantially mounted on a four-wheel truck. An 1,800-gal. tank or a 5,000-gal. tank can be furnished although the latter must be mounted on a pair of trucks. For suburban use a motor driven rotary pump is mounted on the platform so that the tank can be filled at any point where a supply of water is convenient.

The Michigan Manufacturing Company, of Ypsilanti, has issued a novel circular descriptive of the Sweet rail drill made by it. It is in the shape of a hand with the index finger extended to impress the reader with a few facts concerning the drill which has a remarkable record for speed. A 1½-in. hole has been put through a 5⁄8-in. web in 64 seconds, and on a road recently built one man drilled 6,500 13-32-in. holes in the webs of 65-lb. T-rail in nine days. A ball thrust-bearing is a feature of the drill.

"Fatigue of Metal in Wrought Iron and Steel Forgings," by H.



**MAYER & ENGLUND,****10 SOUTH TENTH ST. PHILADELPHIA, PA.****Electric Railway Material and Supplies  
OF EVERY DESCRIPTION.***We carry a Large and Complete Stock of Everything needed for the Construction,  
Equipment and Maintenance of Electric Railroads.***HIGHEST CLASS MATERIAL AT LOWEST PRICES.****NUTTALL GEARS, PINIONS AND BEARINGS.****UNION STANDARD TROLLEYS AND PARTS.****PARTRIDGE SELF-LUBRICATING CARBONS.****INTERNATIONAL REGISTERS AND REGISTER FITTINGS.****VAN WAGONER & WILLIAMS CO. COMMUTATOR SEGMENTS.****COMMUTATORS REFILLED. ASSEMBLED BARS AND MICA.****ELECTRIC HEADLIGHTS. ELECTRIC CAR HEATERS.****MOTOR AND CONTROLLER REPAIRS, ALL KINDS.****STANDARD OVERHEAD MATERIAL.****Prompt Shipments from Stock. Send for Catalogues.**

P. J. Porter, of the Bethlehem Iron Company, South Bethlehem, Pa., is an illustrated pamphlet of 55 pages (a reprint from the Journal of the Franklin Institute) treating of this subject and the manufacture of hollow steel forgings. The author has long been connected with one of the largest forges of the country, and is thoroughly familiar with his subject, which is treated in a very interesting manner. Copies may be obtained of the company.

The Pantasote Company, New York, has received some large orders lately. The Metropolitan Traction Company, of New York, has ordered Pantasote car curtains for 325 open cars, the Nassau Electric Railway Company, of Brooklyn, for 70 open cars, The Brooklyn Heights Railroad Company for 100 cars, and 100 enclosed cars, Kings County Elevated Railroad for 41 cars, the Milwaukee Electric Railway & Light Company for 36 closed cars and in addition curtains are to be furnished for 500 steam cars.

The Buffalo Foot Cycle Company has sent out a price list and discount sheet, also showing the two styles of foot cycle, the Buffalo model and the W. S. Cleveland model. The company has recently received an order for 500 pairs of foot cycles through its agent, A. L. Cunnard, Melbourne, Australia. There are already several foot cycle academies in Melbourne and Sidney, and it is said that "His Excellency" Lord Brassy, governor of Victoria, has pronounced foot cycling the most healthful and life giving of all in-door exercises.

The Pawtucket Brass Foundry, of Pawtucket, R. I., Vulcan Foundry Company, proprietor, has closed a contract with P. P. Crafts of 190 Congress street, Boston, for all the line material to be used in the construction of the Lewiston, Brunswick & Bath Street Railway of Brunswick, Maine. This road will be 30 miles long, and the pipe body brackets are specially designed to suspend two trolley wires 5 in. apart. Much interest is attached to the building of this road, as its construction will embody many new features in electric railway equipment.

The motor cars for drawing the Brooklyn elevated trains across Brooklyn Bridge are now building in Chicago, and are being equipped with Christensen air brakes. The system is similar to that on the South Side Elevated, except that a vacuum instead of a pressure is maintained to operate the brakes. The vacuum pump connected to a 500-volt motor is encased under the car. A vacuum of 26 in. is maintained in six cylinders and this is automatically regulated through the agency of pressure diaphragms. A test was recently made of the pump, cylinders, etc., on one of the cars under construction and proved satisfactory in every way.

Norman & Evans shipped to Geo. P. Kretz a steam switch-back merry-go-round to be placed in Schenly Park, Pittsburg. It reached the city in time for Decoration Day but it was late in the afternoon before operation began. It attracted much attention, being visited by thousands, many going away without being able to take a ride. It was a success in every way and the receipts amounted to nearly \$700. The company reports a good foreign trade, one galloping machine having been sent to South America and one to the French West Indies. The war is interfering somewhat with domestic trade, but it is still better than last year.

The Hoppes Manufacturing Company, of Springfield, O., has just published a new catalog of its live steam feed water purifiers, exhaust steam feed water heaters and steam separators. The catalog fully illustrates and describes these pieces of apparatus and gives full directions for their installation and proper care. A feature that will command the serious consideration of steam users who have not equipped their plants with Hoppes apparatus is the list of those using it. References are given to 290 users of the live steam feed water purifiers with an aggregate capacity of over 138,000 h. p., and to 430 users of the exhaust steam feed water heaters with an aggregate of over 180,000 h. p.

The Dorner Truck & Manufacturing Company, of Cleveland.

O., is now building its new types of trucks: "Criterion No. 11" single, and "Criterion No. 15" pivotal swing bolster. Within the last 60 days this company has built trucks for the following roads: Citizens' Street Railway, Fort Scott, Kas.; Dunkirk & Fredonia Railroad, Dunkirk, N. Y.; Owosso & Corunna Street Railway, Owosso, Mich.; Schuylkill Electric Railway, Pottsville, Pa.; Springfield Railway, Springfield, O.; Cleveland Electric Railway, Cleveland City Railway, Cleveland, O.; Akron Street Railway & Illuminating Company, Akron, O.; Phoenix City Railway, Phoenix, Arizona. A number of orders for foreign shipment are also on hand.

The Chicago, Milwaukee & St. Paul Railroad Company has expended \$250,000 in the elaborate equipment of two new trains, for the "Pioneer Limited" service between Chicago, Milwaukee, St. Paul and Minneapolis. The trains were built by the Barney & Smith Car Company of Dayton, O., and are of extraordinary splendor. Each train consists of mail, express and baggage cars, standard and compartment sleepers, dining and parlor cars, day coaches and reclining chair cars. The cars are superbly furnished in the empire fashion, are lighted by electricity and fitted with buffet and smoking compartments of new designs and costliest decorations. The Pioneer Limited service went into commission May 22.

The Allen & Morrison Brake Shoe Company, of Chicago, advises us that the Chicago City Railway has just completed a test of the Allen-Morrison composite brake shoe and reports its life in that service to be from four to five months, with a saving of one-half in tire wear and increase of 50 per cent in braking power, the test showing all and more than the makers claimed for the shoe. The company is sending out test shoes all the time. The company has been in existence little over three months and as the test shoes wear so much longer than it claimed there is but little to report. On street railroads and elevated there has not been a complaint and the fact of the various roads ordering goods is proof of their superiority. A new steam surface road shoe will soon be out.

The W. R. Garton Company, of Chicago, has moved to new quarters in the Ashland block, where it can give better attention to its patrons. This concern has been in a position to solicit orders for a short time only and is particularly gratified at the success which it has met. For the last 60 days the factory making Raster carbon rheostats has been busy with orders from the Garton Company. The company has also placed orders for Billings & Spencer drop-forged commutator bars, Keystone instruments, Garton lightning arresters, Pittsburg trolley poles, Columbia covered wire and street car gongs, made by the Pittsburg Hollow Ware Company. The business in Crouse-Hinds switches and Bound Brook graphite bushings is very satisfactory, and a number of large orders for the Ohio Brass Company's goods have been promised.

Among the new articles being produced for street railways must be taken into consideration the new line of badges that the well-known firm of Childs & Co., of Chicago, is making. These badges have already been adopted by the large West End corporation of Boston, the Union Depot of St. Louis, the Memphis Street Railway, the Chicago City Railway, and the Lindell Railroad. The badge they are making is something entirely different from the ordinary conductor and motorman's badge. Instead of being a common piece of German silver nickel-plated, on which the conductor can erase the number at will, the badge is composed of fiber and metal so made that the number of the conductor or motorman is as prominent as a felon on the thumb. They have just issued a very handsome catalogue illustrating these badges, and if readers will address Badge Department, S. D. Childs & Co., of Chicago, that concern will gladly send a line of samples and full particulars.

The Consolidated Car Fender Company, of Providence, R. I., reports the steadily growing favor of its fenders by the many companies already using them, and a gratifying increase in the number of roads adopting fenders. The Metropolitan Traction

Company, New York, is equipping its entire system with the Providence fender, and finds its operation entirely satisfactory. One president who tried several fenders before adopting the "Providence," writes the manufacturers: "It is the only fender, and is a positive necessity, not a luxury." One or two of the sometimes several serious accidents most roads experience in the course of a year cost quite as much as an entire fender equipment, while the interest charges on the expense of fenders is only a fraction of the damage account saved. As purely a business investment the money put into fenders cannot be spent to as good advantage in any other way, says President Woodward, and he shows scores of letters from managers using his fenders, in proof of his assertion.

The Consolidated Car-Heating Company, of Albany, N. Y., advises us as follows:

"Judge Lacombe, of the United States Circuit Court for the southern district of New York, on May 26 granted to the Consolidated Car-Heating Company a preliminary injunction against the Gold Car Heating Company and Gold Street Car Heating Company, restraining the latter companies from manufacturing or selling their new style electric heater. The injunction is suspended until November 1, but in the meantime the defendants are put under heavy bonds and the suspension does not prejudice in any way any future action which the Consolidated Car-Heating Company wishes to take to enjoin purchasers of the infringing apparatus. The sweeping decisions obtained last summer in the United States Circuit Court and Circuit Court of Appeals, in which the Consolidated Car-Heating Company's patents were broadly sustained, were used as a basis for the motion for an injunction. This decision still further strengthens the electric heating patents of the Consolidated Car-Heating Company."

The American Brake Shoe Company of Chicago has recently been incorporated and has acquired the "Diamond S." brake shoe patents; William D. Sargent, of the Sargent Company, is president. The company has been organized to maintain a careful inspection of the product of all the licensees manufacturing under these patents, and thus secure to the railroad companies using the shoes a continuance of the good results obtained from the "Diamond S." shoes as made by the Sargent Company. It is also intended to provide inspection of brake shoes in service, giving railroads the benefit of the services of experts. Many inquiries have been received for these shoes from parts of the country remote from Chicago, and the following licensees are now prepared to fill orders, and the American Brake Shoe Company to guarantee their product: The Sargent Company, Old Colony building, Chicago; Security building, St. Louis; Endicott Arcade, St. Paul; 537 Mission street, San Francisco. The Ramapo Iron Works, Hillburn, N. Y., and Havemeyer building, New York City. Parker & Topping, Endicott Arcade, St. Paul and Albina Foundry Portland, Ore., Central Brake Shoe Company, Ellicott Square, Buffalo, and Havemeyer building, New York City.

The interest which managers of foreign lines take in our roads and in American street railway supplies is illustrated in the following letter from the superintendent of the tramway at Sydney, N. S. W. The plant is a part of the "New South Wales Government Railway and Tramways." C. F. Orr & Co., Chicago, to whom the inquiry is addressed, are probably the largest manufacturers of street railway uniforms in the world, their Chicago contracts alone calling for nearly 10,000 suits yearly:

"Gentlemen: On page 96 of the STREET RAILWAY REVIEW, for February, I observe your advertisement with regard to uniforms for street railway men. Could you kindly let me have any illustrated catalogues or pamphlets of your goods?"

"I would inform you that we are operating about 100 miles of tramways in and about the city of Sydney, a great proportion of which is dealt with by steam motors, some 6½ miles are worked by electrical traction, whilst at an early date it is contemplated to convert the whole of the present steam service to electricity. During last year we lifted upwards of 72 millions of people.

"Both the Railways and Tramways are controlled by three Commissioners, on behalf of the Government. Our staff consists of about 1,500 men."



Among the recent orders received by the Walker Company may be mentioned the following: One 250-k. w. belted railway generator and four double 4-A-S-1000 railway equipments, for the Holland (Mich.) & Lake Michigan Railway Company. One 50-k. w. direct connected lighting generator for Russell & Co., Pittsburg, Pa., to be shipped to Sewickly, Pa. One 250-k. w. belted generator for Norton & Taunton (Mass.) Street Railway Company. One 30-k. w., d. c. generator ordered by S. M. Fischer, Chicago, for the Patton Motor Company. One 30-k. w. generator for W. A. Johnson Electric Company, Toronto. One 200-k. w., d. c. generator for Lewiston Electric Light Company, Lewiston, Idaho. Two 225-k. w. belted railway generators for the Wheeling & Elm Grove Electric Railway Company, Wheeling, W. Va. United States Ordnance Department six 10-in. disappearing gun carriages for coast fortifications. The following orders for foreign shipment have been received: Edgar C. Moxham & Co., New York City, for Manaos Railway Company, Brazil, three 130-k. w., d. c. railway generators. Through agents in Japan, Bagnall & Hilles, Yokohama: One 75-k. w. railway generator and switchboard apparatus and two double railway motor equipments, of 3-S-800 motors. Through London Agency: Fifteen double equipments of 33-S-800 motors and type SL controllers. Two 120-k. w. railway generators with switchboard apparatus. Five double railway motor equipments of 3-N-800 motors.

Pain's Fireworks Company has received the warmest testimonials from the street railway and casino companies which have had it give fireworks at their resorts. An officer of the Atlantic Coast Electric Railway writes as follows: "The displays of Pain's Fireworks Company at Pleasure Bay, N. J., during the past season were eminently satisfactory both to our company and to the thousands who enjoyed them." Speaking of the value of the fireworks to Manhattan Beach in a letter to the value of the fireworks to the Manhattan Beach in a letter to Mr. Pain, Austin Corbin, one of the owners, said: "In closing with you your contract for the coming season, I take pleasure in assuring you of the satisfaction we all feel in the continuance of your connection with Manhattan Beach. During the past 20 years you have constantly raised the standard of your pyrotechnic displays to meet the advancing requirements of the public; and in making our arrangements with you from year to year, we have never troubled ourselves as to what you had decided to produce, or how you intended to produce it, so certain did we feel that your efforts would be directed to attain the highest degree of artistic merit. The best evidence that the popularity of 'fireworks' has not diminished, and that you command as hearty a welcome as ever from the American public, appears in the result of last summer, when, although the country had not yet recovered from its recent financial depression, your receipts exceeded those of any previous year." Vice-president Hobart, after the great marine parade in New York harbor wrote to "applaud the skill and inventive genius" which the pyrotechnic display evidenced. The western office and branch works are at 17-19 River street, Chicago, H. B. Thearle, manager.

Our own correspondent in Brussels sends us the following: Young and active gentleman, agent of several important American firms, would like the agency of a firm making electrical specialties for street railway purposes. Address Victor Dourin, 28 rue de la Montagne, Brussels, Belgium.

John Graham, of Wilkesbarre, Pa., who still retains his connection with the Wilkesbarre & Wyoming Valley Traction Company, on June 1, became the controlling spirit in the Bloomington (Ill.) City Railway, and has reorganized the management as follows: President, A. E. Demange, Bloomington; vice-president, John Graham, Wilkesbarre; secretary, William E. Gray; treasurer, J. F. Evans; and general manager, ex-Postmaster John Eddy, of Bloomington.

The 12 miles of track and the plant will be improved by the expenditure of \$50,000 in additions to rolling stock, power house, and new track work.

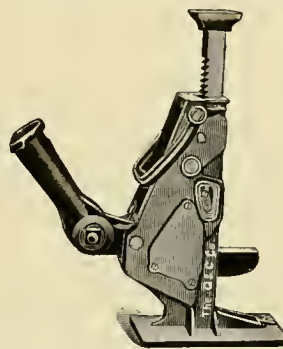
The energy and success which Mr. Graham has displayed in

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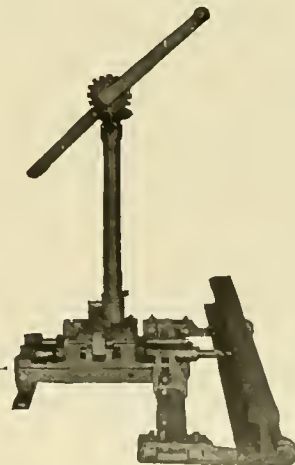
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## NEWS NOTES.

previous operations is indicative of what the city of Bloomington may expect of him in his latest undertaking. The city should and undoubtedly will gladly co-operate in extending liberal and broadgaged assistance in the new work and operation of the road.

A general assignment of A. Weston & Co., of Painted Post, N. Y., was made on June 6, and with it was filed a deed of the Weston Engine Company, to A. Weston, of all its property. The assignee states that the firm will pay dollar for dollar. Mr. Weston, the senior partner died on June 2.

George E. Pratt has taken a line of street railway specialties and gone into business for himself, with office in the Betz building, Philadelphia. Mr. Pratt's long connection and large acquaintance in railway work and supplies will undoubtedly put him in command of a fine business from the start. Among his specialties is a line of trolley wheels, harps, bonds, etc., which are being brought out by the well known Ajax Company, whose famous metal is used on the Empire Express of the New York Central.

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### IF YOU LEAVE HOME

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for the summer, go where you will find, almost literally, a new world. Such a spot is Yellowstone Park. There is no place like it in the South, nor elsewhere. You will be astonished at what you see and learn there. A month's outing in those mountains, 7,000 feet above the sea level, in an atmosphere pure and invigorating, would add years to your life. There are four modern hotels, good roads—maintained by the U. S. Government—for riding, driving or cycling; riding horses and pack trains. Geysers, canyons, mud springs, lakes, cataracts and cascades in large number, are crowded into a space 51 by 62 miles in size. If you cannot afford it, you wrong yourself by not going there. If you cannot afford it, then go to beautiful Leech Lake in Minnesota, a new and popular resort. New hotels, fine fishing and hunting, and good boating at reasonable rates. Send Chas. S. Fee of Northern Pacific Railway, St. Paul, Minn., six cents for Wonderland '98 that describes by pen and picture both resorts. Mention where advertisement was seen.

The president of the city of warsaw, Poland, desires bids for the supply of current for railways and electric lighting.

The council committee on tramways and the borough engineer of Hastings, after examining the tramway systems of Glasgow, Sheffield and several cities on the continent, reported that the trolley system was the best adapted to Hastings and recommended the construction of two lines aggregating 4½ miles in length.

Niort, France, proposes to have electric railways and lights. Inquiries should be addressed to Monsieur le Maire de la Ville de Niort, Deux-Sevres. Consul Jackson of Cognac also reports that a movement is on foot to connect La Rochelle with La Pallice by an electric railway 2.5 miles long. Address P. W. Moreh, Chamber de Commerce, La Rochelle.

The British Electric Traction Company has completed the plans and placed contracts for the conversion of the line of the Dudley & Stourbridge Company between Hart's Hill and Stourbridge into an electric system. A site has been purchased and arrangements made for a power station to supply current to this line.

An electric tramway system is proposed from Rome to Genzano with a branch to Rocca di Papa, 26 miles long in all. The generating station will be located in the center of the system and will consist of five 120-h. p. gas engines connected to 1,200-volt direct current dynamos. The scarcity of water is the cause of the adoption of the gas engines. Each motor car is to be equipped with two 35-h. p. motors and will have one or two trailers, as the necessity demands. The speed of the cars will be 9 to 18 miles an hour, the steepest grade being 9 per cent.

AKRON, O.—The lines of the Akron Street Railway Company will be purchased by General Sam Thomas, of New York city, W. D. Chapman, general manager.

ALBANY, N. Y.—The Albany Day Line Steamboat Company has surveyors at work upon its proposed electric line to the Catskill mountains.

ANDERSON, IND.—The Union Traction Company has absorbed the Clodfelter inter-urban line, for the price of \$100,000, the latter road having been the property of the Indiana Traction Company. Both companies were building trolley lines between Anderson and Marion, but the line begun by the Indiana Company will now be abandoned, and that of the Union Company completed. Charles L. Henry, general manager Union Traction Company, Anderson.

ALLENTOWN, PA.—The construction of the Allentown & Kutztown Electric Railway will be commenced as soon as bids can be advertised and the contract awarded. The road is estimated to cost \$180,000; its officers are H. J. Schmick, president, and George Misch, secretary, both of Philadelphia. The line will connect Allentown and Kutztown.

ANNISTON, ALA.—It is reported that the Anniston Electric Company will sell its road and plant or increase the capital stock and reorganize with the purpose of enlarging and improving the plant. The road was purchased by its present owners, in 1896, from Howard W. Sexton, trustee, and a portion of it was changed to trolley. Mr. Sexton is president of the controlling company.

ARGOS, IND.—It is proposed to build an electric line between Argos and Danville, Ill., to connect Bourbon, Lake Maxinkuckee, and Winamac. Dr. Sears, of Plymouth, Ind., is chief promoter of the road.

ATLANTIC CITY, N. J.—It is reported that a company of Philadelphia and Atlantic City capitalists will be incorporated with a capital of \$2,000,000, to build an electric line between the two cities. The line is estimated to be 57 miles long. Officers, temporarily elected, are Senator J. J. Patterson of Philadelphia, president; A. C. Welhous, of Lancaster, Pa., secretary.

AUBURN, N. Y.—The plan to connect Auburn and Seneca Falls by an electric railway is revived. A year ago the Auburn City road, the Auburn & Western, and the Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction companies, after consolidation, applied to the state railroad commissioners for a franchise for a road between Auburn and Seneca Falls. The project was defeated by an injunction obtained by the New York Central. The injunction has recently been dissolved, and the road may now be constructed.

BALTIMORE, MD.—The City Passenger Railway Company and the Central Railway Company will solidify their traction systems, by connecting the roads in a number of places. Bids are being received for the necessary construction. Walter S. Franklin is president of the City Passenger Company.

BALTIMORE, MD.—The Consolidated Railway Company's car barns were consumed by fire, May 29, and 130 box cars were destroyed, causing the company a loss of \$250,000, which is fully covered by insurance. Presumably the road will be in the market for rolling stock, and ready to award contracts for the erection of a new car house, at once. William A. House, general manager.

BALTIMORE, MD.—The Maryland Electric Railway Company has been granted the right to lay tracks on the Philadelphia road. The railway, which is projected to go to Belair, will be required to provide its own bridges, and its rights are shared by the Baltimore & Gunpowder Company, the two companies using the same tracks.





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VOL. 8. JULY 15, 1898. NO. 7

The article on "Guards for Open Cars" on another page, will have increased interest because of the recent Georgia decision, also reported in this issue, affirming a judgment for \$1,000 and costs in favor of a passenger who was injured by a car on a parallel track, he having alighted on the wrong side.

We were impressed the other day while riding several miles on a street car, with the uniform courtesy and strict attention to their work of the car crew. Old people were assisted on and off, strangers were politely and intelligently informed as to where and how their destinations could be reached, and even the old woman on the front seat who savagely shook her umbrella at the conductor as a notice to stop was recognized by a polite bow, and she was given plenty of time to get clear of the car before the two bells. Whatever may be the good intentions of the management as to the right treatment of its patrons, the fact remains that fine cars, the best machinery that money can buy and all the advantages which make toward comfort and safety cannot compensate for carelessness, indifference and want of politeness on the part of these employes who come in actual contact with the public, and who therefore to a large extent are regarded by the patrons of the road as its representatives. We do know that no position can be more trying to a man's temper, than falls to the lot of the conductor. During the day he must come in contact with from four to seven hun-

dred people, and inevitably of this number are always some ill-natured persons. When a man meets several such in rapid succession it requires considerable poise to escape the contagion. But this is part of the conductor's business—to retain a gentlemanly bearing where others fail to do so, just as the good soldier must carry a cool head under the most trying circumstances. We believe as a rule the street railway employes of the country are a credit to themselves and their companies, but an occasional reminder from the manager, of the great importance of a courteous bearing cannot come amiss, in encouraging the men to maintain a high standard of conduct in the discharge of their trying duties.

"Our road has created a new coming and going, and has not had to depend for its business upon the traffic formerly handled by the steam railroads." These are the words of the manager of an interurban line, and his terse phrase of "a new coming and going" is the essence of the evolution going on throughout the country. It is a business which previously had no existence; the people lacked the facilities, hence they remained at home: because they remained at home acquaintance was limited; because acquaintance was limited the value of an interchange of ideas and experiences was neither understood nor appreciated. And so one might go on weaving a long chain of conditions which the electric car severs with its first trip, instilling a new life and impulse into the community. And this electrifying of whole counties is most aptly defined when we say it is the "new coming and going."

According to a statement in one of our foreign exchanges the electric railways of Europe in 1898 have an aggregate length of 1,422 miles. Of this Germany, France, Switzerland, Great Britain and Italy have 1,210 miles; Germany has almost one-half of the grand total, having 707 miles; France is second with 247 miles; Switzerland third, with 91 miles, and Great Britain and Italy have each a trifle over 80 miles. The total increase in electric railway mileage over that in 1897 is 516 miles, and for the five countries named is 449 miles. The percentages of increase in these countries are: Germany, 77; France, 42; Switzerland, 86; Great Britain, 23, and Italy, 14 per cent.

There are in operation on all electric roads 4,514 cars as against 3,095 in 1897. Of these Germany has 2,493; France, 664; Switzerland, 237; Great Britain, 220; Italy, 311.

We have once or twice reminded managers that they cannot make a better investment than to bind the complete volumes of the REVIEW, each year, and place them on a convenient shelf for reference. It is a complete history of the experiments, achievements, successes and failures of all important matters pertaining to the street railway interests. Our special attention is called to this the day on which these lines are written. The manager of a large road in New England during a call expressed the value which cannot be reckoned in dollars alone, of his files of the REVIEW which date back to the first issue. Time and again, he remarked, has he had occasion to seek data on questions which required immediate knowledge, and for which he desired to show a good authority on the subject, and in such emergencies his files have rarely ever failed him.

The same day we received three letters, one from Ohio,

one from New York and one from England, each writer in need of information on entirely different matters, and in each instance we were able to refer to numerous articles which completely covered the case. Scarcely a day passes but we have one or more such requests for information; sometimes from persons who are new in the work, but usually from managers and others who have been long connected with railway operation. The telegraph also brings similar demands, and where the sender has his file at hand it is quick work to refer him to what he needs. On the other hand where no file is available, and the back numbers long since exhausted valuable time is lost in making a copy of the article, and even then, it lacks the force and influence which always pertains to the printed page.

We repeat, those of our readers who fail to preserve and bind their numbers are depriving themselves of a source of help which when the time of necessity comes, would be worth more than the cost of binding an hundred volumes.

The Massachusetts General Street Railway bill, which became a law the latter part of June, is in many respects as important as it is unique: for it marks a radical departure. While some of the provisions seem severe to operators of western roads which have a much less densely settled population, many eastern managers appear to approve the measure. It will, at least, have the effect of definitely settling several vexatious and constantly recurring, mooted questions, and there is always a grim satisfaction in knowing the worst. The provision which enables the Board to "grant a location" where one town opposes a line desired by two or more other towns is a most excellent one. We publish a full synopsis of the act in this issue.

"The \* \* \* company would increase its business and please the public if it would improve its service in this respect."

These are the closing words of an article in a local paper in a city of about 60,000, in which is set forth in courteous terms the great necessity of improving the destination signs on the cars. There evidently was no disposition on the part of the paper to "roast" anybody: it was not apparently trying to find fault or belittle the excellent service rendered, but its editor recognized the need of an improvement in the direction noted. It calls attention to the fact that the day signs are small and of the same color as the car body, and that at night no colored lights are used.

The manager undoubtedly will now take the matter up and if he is as good a manager as we think he is, will lose no time in correcting existing conditions. What impresses us is, not the local instance cited, but the importance of being so closely in touch with the reasonable wants of our patrons, as to anticipate such requirements, and disarm criticism by affording the least possible occasion for it. We believe, also, that some managers are inclined to do too little riding on their own cars, leaving that duty to assistants. However occupied the business hours, that manager who fails to frequently travel his own lines in his own cars, and in that way literally getting close to the public even though he does not enter into any conversation, deprives himself of a vast amount of valuable information he ought to possess. Many of the demands of the daily press are either unreasonable or absurd, but as a rule the public is reasonable and appreciative to a larger degree than is currently supposed. Hence we say, it is the duty of every manager to do his best to furnish as efficient a service, and as pleasing accommoda-

tions as the earnings of his road will justify, and to anticipate those improvements which are bound to come in time, rather than to wait until the very last minute of grace and reluctantly be forced.

A well fed lion is not apt to bite.

The "Electrical Engineer," of London, in commenting editorially on an article "How to Protect Trolley and Feeder Lines" from the REVIEW, concludes in this manner:

These seem to us to be preventives, but we wonder where the police spend their nights if such bulky stuff as trolley wire can be freely taken away.

It is evident from this that our contemporary does not comprehend the conditions in American cities nor the extent of the electric railways. It is no reflection on the police departments of our cities that precautions have to be taken to prevent certain sections of line and trolley from being stolen.

The thickly settled portions of our cities and towns have long since enjoyed the benefits of electric traction. The city limits are by no means the bulwarks beyond which the electric lines cannot extend. It is safe to say that the greater portion of the mileage of new electric railways built during the past year or two and which will be built in the future will be entirely beyond city boundaries. There are hundreds of miles of electric railways entirely outside the protection of municipal authorities and passing through sections where the uniform of a policeman is never seen. In nearly every city the street railway company has one or more pleasure resorts usually located in some picturesque place on a river or lake or in the rural districts. With the exception of the summer season these lines often stand idle and in unfrequented localities may easily fall a prey to wire thieves.

The progressive spirit of the railway companies which causes them to construct lines into sparsely settled districts and operate cars at a loss has contributed more than any other factor to the territorial expansion of our cities. It is not necessary for the inhabitants to be cooped up in tenement houses as they are in London, Liverpool and Glasgow, for cheaper rent, fresh air and comfort can be secured in the outlying districts tapped by the trolley lines.

Chicago offers an example of what transportation facilities will do for a city. There are over 1,000 miles of street railways, all except 88 miles being operated by electricity. The 1,900,000 inhabitants are scattered over an area of 188 square miles which is one and one-half as great as the area of London with its four and one-half millions of people. Every independent company in Chicago has extended its lines beyond the profitable area and the passenger receipts of some cars barely pay for their operation without including interest charges, office expenses, etc. At first thought this might appear to be poor business policy but from several years' experience the companies have found that houses are soon built in the wake of a trolley line and traffic grows with great rapidity. One of the small electric railway companies whose lines run through the suburbs, reports an increase of 270 per cent in traffic during the past year. Routes that did not pay expenses two or three years ago are paying dividends now. Of these lines many are outside police jurisdiction and cannot be protected as is city property.

Considering the parsimonious franchises authorizing the construction of 20 or 30 miles of street railways to serve an English city of 500,000 it is not difficult to understand why our contemporary does not grasp the extent and development of electric railways in American cities.



On another page will be found the text of Judge Seaman's opinion in the Milwaukee 4-cent fare case to which brief reference was made last month. The counsel for the city made the stock argument of the advocates of ruinously low rates of fares, i. e., the lower rate will so increase the traffic as to make the business profitable, and presumably placed the matter in as strong a light as possible. It was ill-received, however, the court saying of the effort, "No reliable basis is furnished and the argument is too speculative for acceptance." In summing up the testimony as to the value of the property, Judge Seaman says: "I am satisfied that the property of the complainant (the street railway) represents a value, based solely upon cost of reproduction, exceeding five million dollars. And I am further satisfied that this amount is not the true measure of the value of the investment in the enterprise. It leaves out of consideration any allowance for necessary and reasonable investment in purchase of the old lines and equipments, which were indispensable to the contemplated improvement, but of which a large part was of such a nature that it does not count in the final inventory. No allowance enters in for the large investment arising out of the then comparatively new state of the art of electric railways for a large system, having reference to electrical equipment, weight of rails, character of cars and the like—of which striking instance appears in the fact that the electric motor which then cost about \$2,500 can now be obtained for \$800; so that work of this class was in the experimental stage in many respects, and the expenditures by the pioneer in the undertaking may not fairly be gaged by the present cost of reproduction."

The "Indianapolis News" of June 18, 1898, contained the following editorial:

"There promises to be a most curious ending to the fight in Milwaukee between the street railway company and the people. The Milwaukee council enacted an ordinance requiring the company to sell 25 tickets for \$1. The company carried the matter to the courts. It claimed that a 4-cent fare was unremunerative, and introduced evidence to sustain its contention. Judge Seaman, of the United States district court, agreed with the street car company on its showing; declared the ordinance null and void, and gave as a reason for his decision the ground taken by the United States supreme court in the Nebraska maximum rate case, that railway corporations are entitled to a fair return on the value of their property. The city of Milwaukee appealed the case to the higher Federal courts, and now the street railway company has voluntarily conceded a 4-cent fare, on condition that the city withdraw its appeal. Thus the company tacitly admits that its contentions before the United States district court were not true, and incidentally the company places Judge Seaman in a rather awkward position. When the case was in court, the company announced its annual maximum net earning capacity was \$269,000. The judge placed the valuation of the company at \$5,000,000, and then found that the earnings would not justify a reduction of fare. The general impression in Milwaukee is that the road is not worth anything like \$5,000,000, and only recently the corporation protested against a local assessment on its property of \$2,800,000 for taxation purposes. The Financial Chronicle's street railway supplement for 1895 shows that the Milwaukee Company reported gross earnings of \$1,315,963 and net earnings of \$487,375, or nearly double the maximum net earning capacity asserted to the court. The voluntary action of the company would seem to prove that the court had made a mistake or had been deceived, but we imagine that the people of Milwaukee are not sorry at the outcome of the litigation."

While we believed the foregoing to be a rank falsehood we submitted it to Messrs. Sullivan & Cromwell, the general counsel for the Milwaukee Electric Railway & Light Com-

pany, and were favored with the following reply, under date of June 27:

"It is not true that 'the street railway company has voluntarily conceded a 4-cent fare, on condition that the city withdraw its appeal.' No such overtures have been made to the city."

The statement of the "Indianapolis News" that the company reported its net railway earnings for 1895 as \$487,375 is literally true, but as used it is well calculated to mislead the lay reader. The amount given is merely the difference between the "gross earnings from operation" and the "operating expenses" and is the amount known as "net earnings from operation," not all of which is necessarily available for interest and dividends, as any business man will readily appreciate.

There is much that might be said upon the text set forth, but as it is all so obvious there is no need for the comment. It is the spirit illustrated in it, that has so greatly diminished the influence of the daily press.

## NEW YORK STATE ASSOCIATION.

The sixteenth annual convention of the New York State Street Railway Association will be held at the Hotel St. George, Brooklyn, on September 13 and 14. G. Tracy Rogers, president of the Binghamton Railroad, is president of the association; he was elected to this office in 1894 and has been re-elected each year since then.

Among the subjects covered by the papers to be presented at the coming meeting are:

- Points on the care of dynamos.
- The use and abuse of transfers.
- How can we increase our receipts?
- Low joints; how to prevent them.
- The power station from an economic standpoint.
- The office; suggestions for records, reports, etc.
- Track bonding; how can we obtain the best results?
- Street railroad versus the state; the relation to each system for single track roads.
- General track construction; the most approved method of freight and express service on suburban and interurban lines.
- Are air and power brakes on electric cars practicable?
- The most approved plan of long distance power transmission.
- The best method of preventing accidents.
- Pleasure resorts as a means of stimulating travel; are they profitable?
- The effect upon street railroads of the application of electricity to steam; possibilities and advantages from an up-to-date street car service and why the rate of fare should not be reduced.
- Daily inspection of car equipment and how can we accomplish the best results?
- Receipts from other sources.
- How to obtain best results from sale of advertising privileges, power, etc.

The Paris (Tex.) Gas & Electric Light Company has been sold to D. H. Scott, who will make improvements and build an electric railway.

The Third Avenue Railroad Company, of New York, is now at work on the plans to change the Dry Dock, East Broadway & Battery Railroad and the Forty-second Street, Manhattanville & St. Nicholas Avenue Railway systems to the electric conduit. The advisability of converting the Third avenue cable line to electric conduit during this summer is also being considered.

B.B. C. - 414

GUARDS FOR OPEN CARS.

Since the open cars were put in service it has been found desirable in some cities to place some kind of a guard on the side of the car next to the parallel track. Passengers are very careless in alighting from cars, seldom looking ahead or behind to see if there is danger from any approaching vehicle. If this were otherwise it would be much more convenient to leave both sides of the car free for the ingress and egress of the passengers as is done on single track lines. On double track lines having a loop or a Y

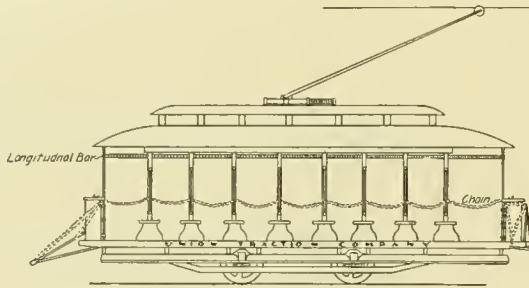


FIG. 1.—CHAIN OR BAR ON PHILADELPHIA CARS.

at the termini it is easy to place some fixed screen or bar along one side. Where there is only a switch and it is deemed necessary to close first one side and then another of the car a suitable and convenient device is more difficult to obtain.

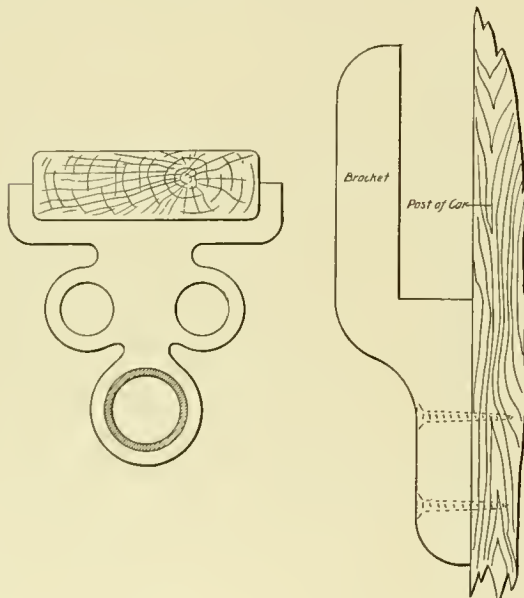


FIG. 2.

FIG. 3.

On many lines it is the practice to hang the wire screens or gates on hooks and at the end of the line they are removed, carried around to the other side of the car and put in place. This occasions serious delay when traffic is heavy and a large number of cars are running. Frequently if an extra pair of gates were placed beside the track at the terminus of the conductor from each car could remove the gates from his car, lay them on the ground and hang the extra pair on the hooks of the car, thus avoiding the necessity of carrying them around the end of the car. The gates can more readily be carried across the track after the car has pulled out.

Some simple and inexpensive devices are in service on a number of systems. The Union Traction Company, of Philadelphia, employs two kinds, a chain and a horizontal bar. In Fig. 1 both the bar and chain are shown. At each end of the bar is a loop of band iron that passes around the rod which supports the roof above the platform. The

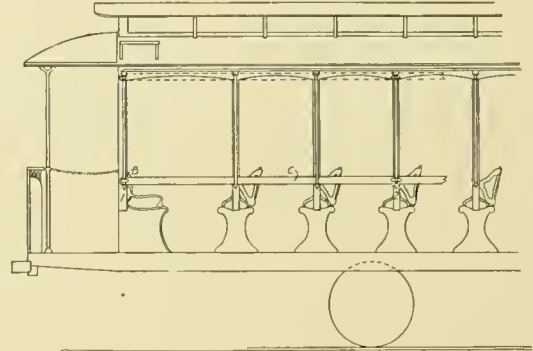


FIG. 4.—BAR ON BALTIMORE CARS.

bar slides up and down inside the standards of the car. The chains are placed between each standard and are fastened to a casting, as shown in Fig. 2, by hooks.

The Cleveland City Railway Company has either a loop or a Y at the end of each line and has removed the inside step altogether. A 2-in. pipe has been placed in sockets attached to each post and also fastened to the dash board at each end of the car at about the height of an armrest.

At Montreal the cars are nearly all single ended and

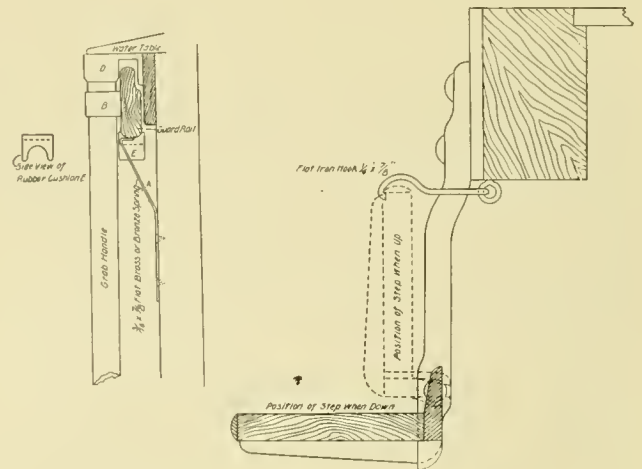


FIG. 5.

FIG. 6.

turn on loops or Y's. A wire screen is fixed on the inner side. The Boston Elevated Railway Company does not consider it advisable or desirable to close the sides of open cars under the condition existing in Boston. Several devices have been experimented upon in the shops and it has been decided that any guard to be effective must either screen the running board or provide for its being turned so that persons cannot ride on the inner side of the car.

The Mahoning Valley Railway Company, of Youngstown, O., closes the inner side of its open cars with a long wooden guard rail, about 3/4 in. thick and 3 in. wide which rests in castings on the inner side of each post, Fig. 3. These guard rails extend the whole length of the car and are changed from one side to the other at each end of the



line by lifting the rail across the car. By placing them on the inner side of the car standards the change is very easily and quickly made. The rails are carried about the height of the backs of the seats. Occasionally a passenger will dodge out beneath them but the company feels that anyone so doing takes upon himself the responsibility for injury.

On the city lines of the Capital Traction Company, of Washington, operated by the conduit electric system, no attempt is made to close the cars on the inner side. For

from getting on and off the wrong side of the car it is hardly satisfactory.

On the cars of the Baltimore Consolidated Railway Company guard rails are placed as shown in Fig. 4. The position of the rail in service is indicated by the full lines and by the dotted lines when raised to offer no obstruction. Fig. 5 is from a detailed drawing showing the method of holding the rail in place when raised. A is the brass spring which holds the rail, B is a brass casting to keep the rail in



FIG. 7.—OPEN CAR OF METROPOLITAN STREET RAILWAY COMPANY, NEW YORK.

the cars on the trolley lines in the suburbs a small bar is run through the brass handles on the inner side and it is changed with little difficulty at the termini.

Most of the lines of the Union Railroad Company, of Providence, are single track and no provision is made for closing the inner side. The Cincinnati Street Railway Company makes no provision for closing the inner side of its electric cars, but on the cable cars there are no running boards on the inner side and the platforms are guarded by several brass rods parallel to the floor. The Market Street Railway Company, of San Francisco, does not attempt to close the inner side of open cars or to prevent the passengers from getting on or off on either side. In New Orleans the side step cars meet with little favor and the New Orleans Traction Company is gradually changing its open cars by cutting an isle through the center, closing both sides

place, C is the wooden guard rail, D is the brass grab handle holder and E is a rubber cushion attached to the lower side of guard rail and rests on the lower grab handle sockets when the rail is down. There are four of these rubber cushions for each rail. The car steps are also hinged so that the inner one can be lifted as shown in the dotted lines of Fig 6. The step is held up by flat iron hooks  $\frac{1}{4}$  in. thick and  $\frac{7}{8}$  in. wide.

Fig. 7 is taken from a photograph of an open car used by the Metropolitan Street Railway Company, of New York. The front platform is guarded by iron gates but the entrance guard consists of an ash rod extending from corner post to corner post and sleeved at each end around the post grab handles. The post grab handles are extended to the height of the water table for the purpose of accommodating these entrance guards and allowing sufficient head room for the egress and ingress of passengers. The rod is held in position at the top by gravity catches let into the post. The step irons are hinged allowing the step board

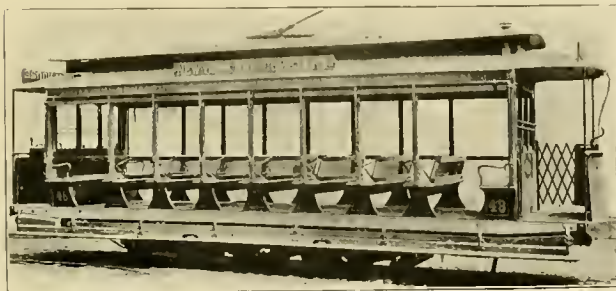


FIG. 8.—STEPHENSON GUARD RAIL.

with an ornamental wire screen about 4 ft. high, enlarging both platforms and putting on platform steps. This style of car receives general approval and the weather is so mild all through the year that a car of this type can be used both winter and summer. The Nashville Street Railway uses a rope run through the grab handles on the inner side. While this is a cheap method and prevents the passengers

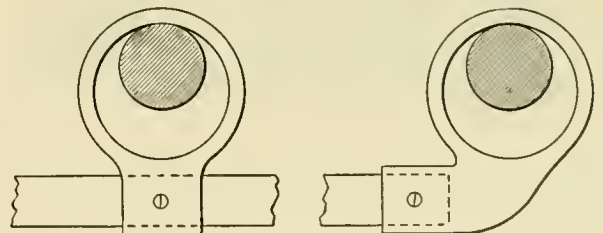


FIG. 9.—BAR ON NORTH CHICAGO CARS.

to be folded against the vertical portion of the step iron. These open cars together with this device were built by the J. G. Brill Company. The cars on the Broadway cable road have also been equipped with this device.

When so ordered by the street railway companies the John Stephenson Company makes a very simple device for preventing passengers from getting on or off an open car

on the wrong side. It consists of a long rail which slides up and down between the grab handles and side posts of the car. One of these rails is on each side. The car shown in Fig. 8 is going in the direction of from right to left of the picture, and the rail on the left hand side of the car is shown "up" so the passengers can get off on that side. This rail is held in place by small brackets which are set into the side posts and held up by springs; by compressing the



FIG. 10.—WEST CHICAGO OPEN CAR.

springs the rail is pushed above them and they snap out and hold the rails in place. The photograph shows the rail on the other side "down." It is held in place by resting on the lower attachment of the grab handles.

The means taken by the North Chicago Street Railroad Company for preventing passengers getting on and off the wrong side of the car are very simple and effective. The hand bar on each post extends from the middle of the seat to the roof with rounded corners top and bottom. A round wooden bar, the length being the distance between the two outer posts, has a brass casting at each end and two at intermediate points with eyes large enough to be passed over the corners of the handle bars. The bar when not in service is slipped up and over the top horizontal support of the handle bar and remains under the eaves of the roof. When

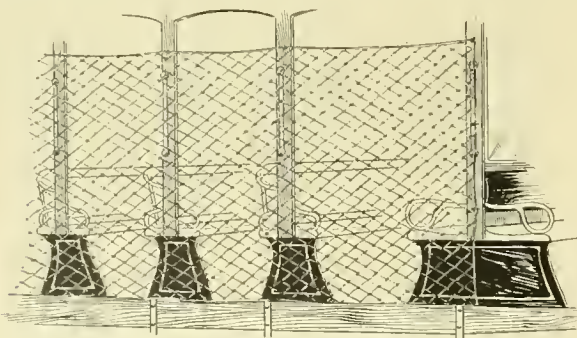


FIG. 11.

in use it is let down and rests on the lower horizontal support of the handle bar, making it difficult for anyone to get into or out of the car. A detail of the brass casting and bar is shown in Fig. 9.

The guard adopted by the West Chicago Street Railroad Company is shown in Fig. 10. An ash strip  $\frac{3}{4}$  in. thick and 3 in. wide slides up and down on the inner side of the grab handles. A gravity catch at each end post holds the strip up in place. When the guard is down the step is raised as may be seen in the picture and is held in position by two flat iron hooks.

The open cars of the La Fayette (Ind.) Street Railway Company have eight posts on a side and a wooden bar is cut off the exact length between the end posts. A slide is made for this bar on the inside of the posts by bolting angle irons on the end posts and two pieces of strap iron,  $\frac{3}{4} \times \frac{1}{4}$  in., at

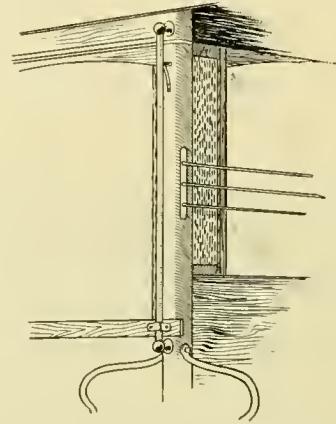


FIG. 12.

two intermediate posts. At the lower ends the iron bands are turned and bolted so as to hold the bar about the level of the backs of the seats. When the side of the car is to be opened the bar is raised up just beneath the roof and held in place by an iron pin inserted in a hole in each endpost.

A novel form of guard is in service on the open cars of the Troy City Railway Company. A net (Fig. 11) 60 in. wide and the length of the car is stretched along the inner side of the car and held in place by hooks at the end and bottom which fasten into eyes on the end and center posts. This form of guard is easily handled for the conductor gathers it into his arms as he unfastens the hooks and carries it to the other side of the car, unfolding it as he puts the hooks in the eyes.

The Laclede Car Company, of St. Louis, has two types of sliding guard rails which it places on open cars when so ordered. The rail is made of wood, about 1x3 in., and ex-

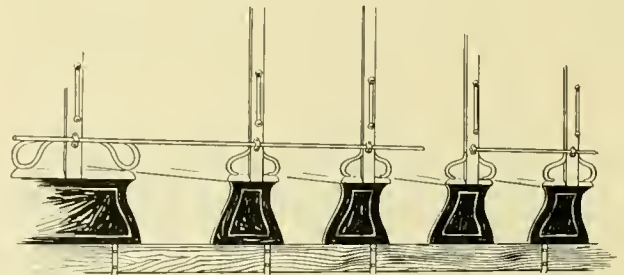


FIG. 13.

tends from corner post to corner post, one on each side of car, and slides up and down between the posts and grab handles. It is held in place under the water table, when not in use, by automatic springs. To accomplish this it is necessary to make the grab handles extra long and place the upper bracket above the water table, as shown in Fig. 12. The rail is secured to the grab handles by loose brackets which slide on the tubes of the handles, one of these brackets being placed on each corner post and two on intermediate side posts. When not in use the guard rail is held in place under the water table by automatic springs, two on each side of the car.



Another guard rail used is made of 1-in. bronze tubing, secured to the posts with suitable brackets, and made in two sections so as to be drawn out from the ends, and provided with pins to prevent tube from coming out. This style of guard rail is shown in Fig. 13 with the tube partly drawn out on one end. Brackets are placed on each post on both sides of the car so that the tube can be used on either side.

Folding steps are also used in addition to the guard rails, arranged so that step can be folded up and fastened in that position to prevent passengers from getting on.

**DEATH OF DR. EVERETT.**

Dr. A. Everett, of Cleveland, died at his home on June 17 from a complication of organic diseases. Dr. Everett was born in Liberty township, Trumbull county, Ohio, November 24, 1821, and was therefore in his 77th year at the time of his death.



DR. A. EVERETT.

In 1860, Dr. Everett became interested in street railway matters and foreseeing the growth of Cleveland acquired a controlling interest in the East Cleveland road, which began operations in that year with two miles of track on unimproved streets and four small

bobtailed cars. Under his management extensions and additions were soon made and system grew until in 1892 it comprised over 50 miles of track and 200 cars. The change from horse to electric traction was begun in 1888. Dr. Everett remained closely identified with this company and was its president when it was consolidated with three other companies to form the Cleveland Electric Railway Company, which was organized in 1893.

**EUROPEAN ELECTRIC RAILWAYS.**

The following table showing the aggregate mileage and number of cars of the electric street railways of Europe is taken from the "Industrie Electrique," the lengths being reduced to miles instead of kilometers:

Country.	Mileage.		Cars.	
	1897.	1898.	1897.	1898.
Germany .....	399.2	797.0	1,631	2,493
France .....	173.5	246.5	432	664
Switzerland .....	48.9	90.8	129	237
Great Britain .....	68.0	83.5	163	220
Italy .....	71.9	82.4	289	311
Austria-Hungary .....	52.1	66.2	194	243
Belgium .....	21.7	42.9	73	107
Spain .....	29.2	37.9	40	50
Russia .....	9.2	19.1	48	65
Sweden and Norway .....	4.7	14.9	15	43
Ireland .....	11.2	14.2	32	32
Servia .....	6.2	6.2	11	11
Bosnia .....	3.5	3.5	6	6
Roumania .....	3.5	3.5	15	15
Holland .....	2.0	2.0	14	14
Portugal .....	1.7	1.7	3	3
Total .....	906.5	1,422.3	3,995	4,514

**MASSACHUSETTS GENERAL STREET RAILWAY BILL.**

**Three Kinds of Tax—Corporation, Franchise and Excise Tax—Corporation Tax Prorated on Mileage Basis—Snow Question Definitely Fixed—Important Provision for "Grant of Location."**

The General Street Railway bill passed by the Massachusetts legislature of 1898 is regarded by conservative men as one of the best of its acts. The relations between street railways and the communities were growing more strained, and numerous bills were introduced, and very valuable time of the legislature taken up every year as the result of such strained relations. In 1897 Senator Irwin, chairman of the committee of street railways, concluded, after many months of effort, that no committee of the legislature could properly investigate the subject and prepare a proper bill, the result was a bill introduced by him, "To provide for the appointment of a committee to investigate the subject of the relations between street railways and municipal corporations." The governor appointed Hon. Charles Francis Adams, Hon. W. W. Crapo and Hon. E. B. Hayes of Lynn, as the committee, and it was universally recognized as a strong board.

Mr. Adams investigated the subject abroad, and Mr. Crapo and Mr. Hayes investigated it in the principal cities of the United States and Canada. Later the committee gave extended hearings at the State House, at which appeared the public, mayors, city solicitors and selectmen of the different cities and towns, and representatives of the street railway companies, and all of them had the fullest opportunity to be heard. (See argument of Mr. Burdett, STREET RAILWAY REVIEW, January, 1898, p. 5). As a result of the investigation the committee presented a report (See REVIEW, February, p. 117) and a bill to the legislature which is the first official report upon the subject made by the government of any state or country. The report is a model of its kind and together with its valuable appendices (See REVIEW, April, p. 263; May, p. 294.) is a volume of reference which should be in every library in the country. The report and bill were referred to the street railway committee, and the latter committee also gave extended hearings at which the governor's committee appeared and testified. After the hearings were closed, a sub-committee from the street railway committee, the governor's committee and a committee from the street railways met and went carefully over every section of the bill. As a result of all the labors, Senator Irwin drew up the bill which is, substantially, now the law.

The provisions of the bill do not seem to be clearly understood, notwithstanding the publicity which it received, therefore, a summary of its principal features may be in order. There are three kinds of taxes referred to in the bill: a corporation tax, a franchise tax and an excise or commutation tax. The first changes the present method of distributing corporation taxes in so far as they apply to street railways.

At the present time corporations pay taxes to the state treasury and such taxes are distributed to the several cities and towns of the commonwealth where the stockholders reside. So much of the tax as is assessed upon shares of stock held by stockholders who reside outside the commonwealth is retained by the state treasury. Under the new law such

taxes are levied and collected in the same manner as hitherto, but they are distributed to the cities and towns wherein each company is operated in the proportion which the tracks operated in each city and town bear to the whole system of each company. To illustrate: If a street railway company operated 20 miles of tracks, 10 miles in one city or town, and 5 miles in each of two other cities or towns, and it paid \$4,000 in state taxes, the first would receive \$2,000 from the state treasurer and each of the two others \$1,000. This will be of great benefit to cities like Lynn, Fall River, Taunton and Worcester, inasmuch as the stock of the companies of the above cities is owned principally outside the state.

The franchise tax is rated according to the dividends paid by the companies over and above 8 per cent. For such amounts of dividends as the companies pay over 8 per cent,

as tracks are usually upon the sides of highways and snow is not removed by teams. Substantially, then, the cities have placed upon them the expense of teaming snow away or making the streets safe for public travel. In the debates, some seemed to think that all expenses for repairs of tracks and for removal of snow and ice were to be taken from the street railways and placed upon the cities. The repairs of streets and removal of snow in teams will be only nominal, while in the cities, that care of streets at such times as they may get out of order when the street railway companies are doing no work in connection with the same.

To meet the expenses of the items of repairs and snow, a commutation tax is imposed upon the companies of substantially 2 per cent on the gross receipts of the city roads, and of 1 per cent of the gross receipts of the smaller companies.



LOADING TRANSPORTS AT TAMPA.

they will be required to pay a similar amount into the state treasury. This money will be retained by the state treasury and will not be distributed according to mileage.

The third or commutation tax is the one which appears least understood. The governor's committee recommended that the opportunities for friction between the municipalities and the street railway companies should be removed so far as possible, and with that in mind, recommended that the dual responsibility for the maintenance and care of streets should be discontinued. To accomplish that the act provides that the surface of the streets shall be cared for in condition and materials, by the local authorities. When the companies build or rebuild tracks, or make any changes in tracks, all work in connection therewith shall be borne by the companies and shall be performed to the satisfaction of the local authorities. The local authorities also take care of snow and ice after its removal from the tracks by the companies. This expense to the towns is only nominal inasmuch

Inasmuch as such payments are not intended to be an additional burden upon the companies, but only in lieu of expenses borne by the cities and towns which were previously borne by the companies, the percentage figures are estimated. It is provided, however, that if the actual facts show that the percentage is too high or too low, the municipalities or the companies may petition the Board of Railroad Commissioners for a hearing at any time after three years, for a new rate, and such rate will remain fixed for another period of three years. If, however, any city or town in which a street railway is operated by a company which operates in several cities and towns should feel that it were not getting a proper proportion of such commutation tax, it can, at any time, petition the Board of Railroad Commissioners for a hearing and adjustment. The commutation tax is also distributed in each city and town in proportion to miles of track operated in such city or town bears to the whole track operated by the company. The street railway companies



claim that the 2 per cent tax is from 1 to 1¼ per cent greater than the actual expense placed upon municipalities, and the governor's committee stated that their own figures were in excess of actual expense.

In addition to the foregoing general taxation features, there are other features of the act possessing more or less interest. One is, that in case the local authorities may revoke locations, such revocation shall not go into effect until approved by the Board of Railroad Commissioners. The second is where a location has been granted, if a majority in value of property owners along said location, or at least 10 persons should object, they may petition the Board of Rail-

## THE BUSY SEASON AT TAMPA.

Tampa is situated at the head of Hillsborough Bay, an arm of Tampa Bay on the western coast of Florida, and is some 200 miles north of the southern extremity of the peninsula. It has a population of about 20,000, having had a rapid growth since 1890. While Tampa has long been a popular winter resort, the magnificent Tampa Bay Hotel being a short distance from the city, it had never before so large an addition to its population as was caused by making it the principal point of embarkation for the military expeditions sent against Cuba and Puerto Rico.



SCENES AT TAMPA, FLA.

road Commissioners, and the location thus granted cannot be built upon until after approved by said Board. The third is, if the authorities of an intervening town should refuse a grant of location and thereby prevent two or more towns from being connected by street railway service, the Board of Railroad Commissioners may grant a location.

The Boston Elevated Railway is excluded from the act, and is a class by itself under its amended charter of 1897, except with respect to the distribution of state taxes. In that respect the state tax is distributed to the cities and towns according to length of track.

All in all the act is considered a step in the right direction, and one which inaugurates principles entirely new in dealing with street railway properties.

Up to June 1, more than 20,000 troops had been concentrated at Tampa and as many more have been added since then. Sixteen thousand of these were sent to Santiago under General Shafter about the middle of June and the later expeditions further reduced the number. But Tampa will no doubt remain one of the most important camps until the war is over.

Considerable delay in embarking troops at first resulted because there were not sufficient facilities for storing the provisions and other supplies, which had to be transferred from the railroad cars directly to the transports. The government, however, engaged all the store rooms and warehouses that were available and the congested condition of the railroad yards was much improved.



The street railway system of Tampa comprises the Consumers Electric Light & Street Railroad Company and the Tampa Suburban Railroad Company which is closely con-

ly taxed to carry the traffic, especially in evenings, between 5 and 8 p. m.

By the courtesy of George D. Munsing, superintendent of the street railway companies, we have received the photographs of the camp scenes and the map which are reproduced here. The map shows the location of the troops which it will be seen are encamped in all parts of the city. One of



MAP OF TAMPA STREET RAILWAY LINES.

nected with it, both companies being at present so unfortunate as to be in the hands of a receiver. For the last three months, however, the traffic has been more than doubled and we trust that this prosperity may continue long enough for the receiver, Chester W. Chapin, to resume the use of his old title of president.

Notwithstanding the popular impression that Florida is a low, flat country, the Consumers Company makes use of water power, having built a dam across the Hillsborough river at a point indicated in the accompanying map. This map shows the location of the street railway lines which aggregate 30 miles, all operated by electricity. The equipment comprises 27 motor and 3 trail cars, which have been severe-



CUBAN VOLUNTEERS—TAMPA.

the most interesting of these pictures is that showing a company in one of the regiments of Cuban volunteers organized in Tampa. The others are scenes in camp showing the brave soldier boy at home and, an equally important member of military society, his faithful though at times obstinate ally, the army mule. Two of the views show the line of transports tied up at the wharf and troops en route to take ship for what are at this writing (though we hope not for long) foreign ports.

## CONSOLIDATION AT TRENTON, N. J.

It is announced that the Trenton Passenger Railway Company is about to consolidate with the Ewing Passenger Railway Company, the Mulberry Street Railway Company and the Pennington Avenue Passenger Railway Company. The new company will be called the Trenton Street Railway Company.

These separate companies were organized to prevent an injunction stopping the work of extending the Trenton Passenger Railway; the differences with S. K. Wilson, one of the stockholders of the company who objected to the extensions, have been adjusted and the consolidation will result.



TRANSPORTS BOUND FOR CUBA.



## DECISION IN THE MILWAUKEE 4-CENT FARE CASE.

The Milwaukee Electric Railway & Light Company and the Central Trust Company of New York, as trustee of the railway company's mortgage, filed bills in the Circuit Court of the United States for the Eastern District of Wisconsin, for the purpose of determining the validity of the so-called 4-cent fare ordinance of the city of Milwaukee, and praying for an injunction against the enforcement of the provisions of said ordinance on the ground that the ordinance was unreasonable, in that it would deprive the railway company of the right to charge 5 cents per passenger for a continuous ride upon its cars, and also upon the ground, as more particularly set forth in the bill of the trust company, that the city of Milwaukee did not have the power under its charter to pass an ordinance regulating the fares of street railroads in the city of Milwaukee.

A preliminary injunction was obtained upon the filing of the bills, which was continued during the pendency of the action. Testimony was taken and the cause submitted on final hearing in April, 1898.

Messrs. Sullivan & Cromwell, of New York City, represented the Milwaukee Electric Railway & Light Company, and associated with them were Messrs. Miller, Noyes, Miller & Wahl, of Milwaukee. Messrs. Butler, Notman, Joline & Mynderse, of New York, and James G. Flanders, Esq., of Messrs. Winkler, Flanders, Smith, Bottum & Vilas, of Milwaukee, represented the trust company.

The cause was submitted after argument on final hearing to Hon. William H. Seaman, United States district judge for the eastern district of Wisconsin, sitting at circuit, who rendered the following opinion:

The main controversy in each of these actions is whether the ordinance of June 11, 1896, unreasonably fixes rates of fare which would deprive the complainant of its property without due process of law, and thus violates the fourteenth amendment to the constitution of the United States. A further question is raised by the bill filed on behalf of the bondholders, and is pressed by argument in support of both bills, whether the municipality had power to regulate rates beyond the provisions contained in the several franchises which are vested in the complainant street car company limiting only to a 5-cent fare. Both contentions are of serious import, involving on the one hand consideration of the rights of the community in respect of a great public utility and interference with acts of municipal control, which are presumptively inviolable, and on the other hand affecting the preservation of private rights of property where investment has been made in a great undertaking of public nature on the faith of existing and probable conditions, and where, by reason of its nature, there can be no withholding of operation by the company, even if unremunerative (*Ames v. U. P. R. R. Co.*, 64 Fed. Rep., 165, 177; *Wright v. Milwaukee Electric R. & L. Co.*, 95 Wis., 29, 36).

Further investigation has confirmed the impressions stated at the hearing that the constitutional question was so clearly presented by the pleadings and testimony, and was so distinctly of federal cognizance, that it should be first considered. Certain rules to interpret and apply the limitations of the constitution in this class of cases are well settled by decisions of the supreme court. If the state of facts shown by the evidence clearly establishes a case of impairment within these rules, it will be unnecessary to pass upon the complicated question of general power, as one of first instance, calling for the interpretation of various statutes and ordinances.

The ordinance under consideration provides that tickets shall be sold, good for one fare, including one transfer, "in packages of six for 25 cents, and 25 for the sum of one dollar," thus making a reduction of the regular 5-cent rate to all who so purchase tickets. Assuming, therefore, without so deciding, that the general power to fix and regulate the terms and rates to be charged subsists in the municipality—namely, that by delegation it became vested with, and still retains, the full extent of legislative power undoubtedly possessed by the state—there can be no inquiry here as to the wisdom or good policy of exercising the

power so delegated, that being a matter of municipal discretion, over which the courts have no right of supervision or review. Nor is it open to inquiry in this case whether there is a public demand or need for the enactment, or whether it is just and reasonable in all its provisions, except for the single purpose of ascertaining its infringement of rights which are guaranteed to the complainant by the constitution.

Upon this record it must be taken as true that enforcement of the ordinance would operate to reduce materially the net revenues of the street car company. There is effort on the part of the defendant to show that the probable increase of passengers through the method of commutation tickets would make up for the reduction in rate, but no reliable basis is furnished and the argument is too speculative for acceptance; whilst on the part of the complainant the testimony is founded upon practical and varied experience, and clearly shows it to be improbable that any increase in travel would yield receipts over and above the additional expense necessarily entailed to offset the decrease in gross receipts appearing *prima facie* from the reductions in fares. The claims are that a loss of income would result of "somewhere between 10 and 15 per cent of the gross earnings," and estimates are presented by several witnesses of a net loss ranging from \$87,000 to \$140,000 per annum. It is sufficient for the present consideration that the ordinance must be regarded as a measure which reduces the rates of fare materially and consequently would impair materially the net revenue produced by the property, and no analysis of the testimony upon that point is necessary; nor is any attempt required to state, even approximately, the amount of loss.

The law which must govern when the facts are determined is concisely and pertinently stated in the opinion by Mr. Justice Harlan, speaking for the supreme court in *Smyth v. Ames*, 18 Sup. Ct., 418, 426, as follows:

"In view of the adjudications these principles must be regarded as settled:

"1. A railroad corporation is a person within the meaning of the fourteenth amendment, declaring that no state shall deprive any person of property without due process of law, nor deny to any person within its jurisdiction the equal protection of the laws.

"2. A state enactment, or regulations made under the authority of a state enactment, establishing rates for the transportation of persons or property by railroad that will not admit of the carrier earning such compensation as, under all the circumstances, is just to it and to the public, would deprive such carrier of its property without due process of law, and deny to it the equal protection of the laws, and would, therefore, be repugnant to the fourteenth amendment of the constitution of the United States.

"3. While rates for the transportation of persons and property within the limits of a state are primarily for its determination the question whether they are so unreasonably low as to deprive the carrier of its property without such compensation as the constitution secures, and, therefore without due process of law, cannot be so conclusively determined by the legislature of the state, or by regulations adopted under its authority that the matter may not become the subject of judicial inquiry."

And this opinion reviews the line of decisions upon the subject and clearly approves the application of the same doctrine to legislative regulation of charges, over toll-roads, in *Covington, etc., Turnpike Co. v. Sandford*, 164 U. S., 578, 594. Therefore it must be regarded as established beyond question that the power to regulate the rates of fare, which is here assumed to rest in the municipality, is subject to these limitations: (1) That there is reasonable need on the part of the public, considering the nature and extent of the service, of lower rates and better terms than those existing. (2) That the rates and terms fixed by the ordinance are not clearly unreasonable in view of all the conditions. Neither of these considerations is independent of the other, and, although the public interest is of the first importance, the test is not what is desirable upon the part of either, but



what is reasonable in respect of the rights of both. As stated in *Smyth v. Ames*, supra; "What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience. On the other hand, what the public is entitled to demand is that no more be exacted from it for the use of the public highways than the service rendered by it is reasonably worth." So in *Covington, etc., Turnpike Co. v. Sandford*, supra, it is clearly held, in the same view of mutual consideration, that it is neither the right of the corporation to subject the public "to unreasonable rates in order simply that stockholders may earn dividends," nor of the public to have the use of the conveniences thus furnished, except "upon payment of such tolls as in view of the nature and value of the service rendered by the company are reasonable;" but that "each case must depend upon its special facts;" and the reasonableness of rates must be measured by all the conditions, including, of course, the reasonable cost of operation and of maintenance "in good condition for public use, and the amount which may have been really and necessarily invested in the enterprise."

The difficulties presented in this case do not therefore rest in any doubt as to the general principles which must be observed, nor in ascertaining the actual facts disclosed by the testimony as a whole, so far as material to this controversy. Although the testimony on the part of complainant makes a volume of 1,445 printed pages, and that of the defendant 163 pages, the only substantial contentions of fact relate to items of expenditure and claims of credit, by way of depreciation presented on behalf of the complainant, as entering into the showing of net revenue, and to the present or reproduction value of the plant. And it may be remarked in passing that this testimony is so well classified and indexed with such fair summaries in the briefs that the task of examination has been materially lightened. But the sole embarrassment in the inquiry arises from the wide divergence which appears between the actual and undisputed amount of the cash investment in the undertaking and the estimates on either hand of the amounts for which the entire plant could now be reproduced, in the view that the line of authorities referred to do not attempt to define or specify an exact measure or state of valuation, and leave it within the principles stated, that "each case must depend upon its special facts." Therefore, the two-fold inquiries of reasonableness above indicated are of mixed law and fact and start with the presumption in favor of the ordinance (1) that the prevailing rates exacted too much from the public, and (2) that those prescribed are reasonable.

1. Are the terms and rates fixed by the company excessive demands upon the public in view of the service rendered? The Milwaukee Street Railway Company, of which the complainant is the successor in interest, was organized in December, 1890, for the purpose of establishing an electric street railway system which should cover the entire field for the city of Milwaukee. There were then in operation five distinct lines, owned separately, operated mainly by horse or mule power, each charging separate fares and having no system of transfers. It is conceded that the service was slow and antiquated, was not well arranged for the wants of the city, and was generally inadequate and unsatisfactory. As the old lines occupied the principal thoroughfares, and the public interest prevented the allowance of double lines in such streets, the improvement could not be made effective unless those lines were purchased or in some manner brought into the proposed system. They were gradually acquired, at prices which may appear excessive when measured by results, and during the ensuing period of about three years the work of installing the new system was carried on, involving an entire reconstruction and rearrangement of the old lines and extensions, new and improved equipments throughout, at an expenditure of over \$3,000,000, aside from the cost of the old lines. As a result, at the time the ordinance was adopted, the mileage of tracks had increased from the previous aggregate of 110 miles to 142.89 miles, reaching every section of the city with shorter and better routes, and furnishing 38 transfer points, with a universal transfer system—a feature of special value to the public, as a single fare of 5 cents gives a maximum length of ride more than double the old arrangement; the service was improved in speed and regularity 50 per cent or more, with better cars and less inconven-

ience, and it appears beyond question that it was generally more satisfactory and economical from the standpoint of the public. In other words, the service was materially enhanced in its value to the public, without any increase in either normal or maximum charges, affording rides for 5 cents which had previously cost two, and even three, fares; and against all these advantages there appears only a single benefit extended by three out of the five constituent companies which is not given under the new arrangement—namely, in the sale of commutation tickets—an emission for which there seems to be plausible excuse and offset in the universal system of transfers, aside from the other advantages. Surely, therefore, no imposition upon the public appears through any comparison between the old and the new service and rates. Nor does it find any countenance in comparison with either service or rates which prevail in other cities, for it is shown in this record, and is undisputed, that the 5-cent rate is almost universal; that commutations are exceptional in cities of like class, and arise out of exceptional conditions which are not fairly applicable here; and that instances of lower rates are so clearly exceptional that they cannot have force for any affirmative showing of reasonableness in the instant case. Nevertheless, with the burden of proof on the defendant, these considerations are not controlling, unless it further appears that the earnings of the company are insufficient, in view of the amount which may justly be regarded as the investment in the undertaking to warrant the making of rates and terms which are more advantageous to the public. The interests of the public in its highways are paramount, and, if the service can reasonably be afforded more cheaply in Milwaukee than in other cities of like class, the community is entitled to the just benefit of any possible conditions which may tend to that result. The issue in that regard must be met under the second branch of inquiry, but I am clearly satisfied that this first question must be answered in favor of the complainant, if the evidence sustains its claim that lower rates would be confiscatory, and not compensatory.

2. Are the earnings of the property insufficient, in view of all the conditions, to justify this reduction in the rates of fare? Solution of this inquiry depends upon the showing (1) of earning capacity at existing rates and (2) of the "amount really and necessarily invested in the enterprise," and upon the conclusion (3) whether the ratio of return upon the investment is excessive. In the statements which are referred to both parties have adopted a ratio, so far as necessary, to separate the electric-lighting plant owned by the complainant, so that the statements which follow relate exclusively to the street-railway plant, except where otherwise mentioned.

(1) The question of earning capacity is confined by the testimony to the results of three years' operation, being after the system was fairly installed and inclusive of the year in which the ordinance was adopted—namely, 1894, 1895 and 1896. It is suggested on behalf of the defendant that these years were exceptional, for one cause and another, and are not a fair criterion for future earnings under more favorable circumstances, but the suggestion is without force in this case, because the ordinance operates upon these very conditions, and must, of course, be predicated upon them—upon existing facts and not upon mere future possibilities—and so determined the instant case, cannot affect rights under new conditions.

The proofs on the part of the complainant furnish in detail from the books of account the gross earnings, the various items of expense and of charges for which deduction is claimed, excluding any payments of, or allowance for, interest on the bonded indebtedness, and state the net earnings as follows:

In 1894 .....	\$ 64,868.77
In 1895 .....	269,202.30
In 1896 .....	100,628.81

For this showing, it appears that deduction of \$247,324.88 is made in 1894 for "depreciation," being the amount apportioned in that year to meet the alleged annual loss by physical depreciation of the plant, to keep the capital intact. No such deduction is made in 1895 and 1896, because not shown in the books, although it is insisted that like credit is due in each year for the purposes of this case.

The defendant concedes the correctness of the showing as to



the gross earnings, but disputes certain large items, for which deductions are made in the above statement, corrects some items and denies that any allowance should be made for depreciation. Aside from the fact that report and statements of financial condition made from time to time by the company omit many of the deductions here asserted, these contentions on the part of the defendant rest solely upon the books of account kept by the company, and the testimony of Mr. DeGrasse, stating his conclusions as an expert accountant from examination of such books, with the following result as to net earnings:

In 1894 .....	\$387,074.70
In 1895 .....	479,621.11
In 1896 .....	66,520.99

But this total for 1896 erroneously includes an allowance of \$160,550 paid for interest on bonds, which should be excluded on the basis assumed, and would make the net earnings for that year, on his computation, \$227,070.99. In this statement, the allowance for depreciation in 1894 is excluded by Mr. DeGrasse, because that item was, in fact, charged off upon change in the system of bookkeeping. He also excludes large amounts of undoubted expenditures, upon the hypothesis that they belong to "construction account," as covering permanent improvements, and not to "expense of maintenance," as stated; rejects certain payments as accruing on account of previous years; and certain sums apportioned and charged off to meet damage claims; and makes correction as to taxes, for which the book entries were made in advance upon estimates by way of apportioning the expenses of the year, pending litigation and other causes. However valuable this testimony is for analysis of the bookkeeping methods and for correction of certain charges, it is clearly insufficient, without other support, to contradict the undisputed testimony, both positive and expert, on the part of complainant, which verifies substantially its contention upon the disputed subjects of deduction; namely, that the expenditures so charged were largely, if not wholly, of such nature as to justify deduction for "maintenance;" and that depreciation is a well-recognized fact in all such plants, for which allowance must be made to save the capital from impairment, without regard to any question of its entry upon the books.

Making allowances for maintenance alone in accordance with the analysis presented by the expert witnesses Goodspeed, Coffin, McAdoo and Beggs, taking in each instance the estimate most favorable to the defendant, I am satisfied that the defendant's claim of net earnings must be materially reduced, and that the largest amounts which can be assumed upon its theory excluding any allowance for depreciation, except that for 1894 the "maintenance" allowance is increased as indicated by all the witnesses, was necessary, would be approximately:

In 1894 .....	\$230,000
In 1895 .....	340,000
In 1896 .....	115,000
	\$685,000

making the average earnings per year, say, \$228,333.

In reference to the element of depreciation, the witness Beggs gives the following lucid explanation: "I think experience has demonstrated that the utmost life that can be expected from the best roadbed that can be laid today would be, at the outside, 10 to 12 years, when it would have to be almost entirely renewed. The Milwaukee company is in that condition today, which, because of the different periods that the track went down, and due to the fact that it was not all put down at one time, that it could now commence—must of necessity commence—to lay about 12 miles of track annually, being about one-twelfth of its total mileage, and will be required, whether it wishes to or not, to lay that amount annually hereafter, and will thereby be keeping the tracks fairly up to the standard. The same applies, I might say, to the equipment; in my estimate I have calculated that the Milwaukee company must do this year, which, as a matter of fact it is doing, what it did last year, in other words, put on not less than 20 of the most modern, best-constructed equipments, thereby keeping its standard up to the minimum it has now, of 240 equipments; because I think it is fair to assume that the average life of the double equipment

taken as a whole will not exceed 12 years; the life of the motor being somewhat less than that, and that of the car we hope may exceed it possibly several years; I mean the car bodies, but that, in the main, we hope that we will get an average life of twelve years out of them; so, taking 20 equipments annually, you would keep to your standard of 240 equipments, which is absolutely necessary to maintain, to operate the Milwaukee Street Railway; I mean, cars complete with motors and complete electrical equipment."

For the causes thus stated, within general rules which are well known, it is manifest that this element must be taken into account before it can be determined that earnings derived from a plant are excessive; and in the same line there is much force in the argument of counsel that consideration should also be given to the factor of depreciation by amortization of franchises, as all the franchises in question terminate in the year 1924. The latter, if allowed, would be a matter of simple computation, but a just measure, of physical depreciation seems, to some extent, although only partially, involved in provisions for maintenance; and, whilst the testimony is very full and instructive upon this subject, it does not save from serious difficulties in the way of stating a definite ratio or sum for such allowance. I am, however, clearly of the opinion that neither of these elements is essential to the determination of this case, upon any aspect presented by the testimony, and leave it so far open that it may serve as an important factor of safety in either view.

(2) As to valuation: For purposes of the company the value of property, including both railway and lighting plants, appears to have been placed at \$14,250,000, represented by the issue of bonds for \$7,250,000; preferred stock, \$3,500,000, and common stock, \$3,500,000; but this aggregate was clearly excessive, after excluding the electric lighting department, and on no view can it be taken as the basis for the present consideration. The statements of the actual cost of the constituent street-railway properties, including the cash investment for improvements, are necessarily complicated from the fact that payments were partly made in stocks and bonds, and the aggregate amount varies according to the ratio of valuation placed upon the bonds alone, in two statements, on which the stock is excluded, and in one statement, which values both stock and bonds—the minimum being \$9,024,107.85, and the maximum \$11,313,829.84. The former amount was subsequently modified (p. 465, Complainant's Proof), making the statement of cost \$8,885,644.17, and as this excludes any valuation of stock, and places the value of the bonds at the discount which was agreed upon between the parties, and which also seems fair, it may justly be taken as representing the true amount invested. But adoption of this purchase amount does not meet the issue, as it is the value of the investment, and not the amount paid, which must control. On the other hand, both parties introduce testimony placing valuations upon the various items of the plant as it exists in fact, upon the basis of its reproduction value. This amount, as stated by the witnesses for complainant, aggregates \$5,153,287.76; whilst on the face of defendant's proofs the value of the tracks and equipment is placed at \$2,358,799, the real estate and buildings being valued separately, and the highest valuation of the real estate being \$236,949, and of the buildings \$208,449, making the aggregate \$2,804,197. It appears, however, that these estimates on behalf of the defendant omit 27 miles of track, many parcels of real estate, and other items so that counsel for defendant concedes that this aggregate should be increased to \$3,679,631. The wide difference in these amounts is mainly due to divergence in the estimates upon tracks and equipment, as the amounts on real estate and buildings, after allowance for the omissions, would appear higher on the valuation submitted by the defendant than those of the other side. For the valuation of tracks and equipment the defendant relies upon the estimate made by Mr. Partenhelmer, a witness of apparent ability and experience as a street-railway contractor engaged in business at Chicago, but his examination of the plant was cursory, being made within three days, and could not give the detailed information upon which a just estimate for this inquiry must be based, and it is conceded that he left out of consideration many important items (aside from the error in mileage), which should enter in and would greatly increase his amount. Both upon its face and by reference to other sources of information



this estimate is far below any fair valuation for the purpose in view, either at the sum stated by the witness, or with the additions conceded on behalf of defendant, the former amount being in fact \$320,000 short of the actual cash expenditures by the company for construction and equipment. Opposed to this the estimate for complainant is made by Mr. Clark, an expert of distinction in this line, who gave weeks to the examination, with the aid of a corps of assistants, and presents the results in detailed statements, so that his testimony and estimates impress me as well founded; and they are supplemented and supported by the testimony of Mr. Coffin, Mr. Payne and other witnesses, and by comparative showing of mileage valuations in Massachusetts which appear in the noteworthy system of reports published by that state. I am satisfied that the property of complainant represents a value, based solely upon the cost of reproduction, exceeding five million dollars. And I am further satisfied that this amount is not the true measure of the value of the investment in the enterprise. It leaves out of consideration any allowance for necessary and reasonable investment in purchase of the old lines and equipments, which were indispensable to the contemplated improvement, but of which a large part was of such a nature that it does not count in the final inventory. No allowance enters in for the large investment arising out of of the then comparatively new state of the art of electric railways for a large system, having reference to electrical equipment, weight of rails, character of cars and the like—of which striking instance appears in the fact that the electric motor which then cost about \$2,500 can now be obtained for \$800; so that work of this class was in the experimental stage in many respects, and the expenditures by the pioneer in the undertaking may not fairly be gauged by the present cost of reproduction. Of the five million dollars and over paid for the acquisition of the old lines it would be difficult, if not impossible, from the testimony, to arrive at any fair approximation of the share or amount of tangible property which enters into the valuation in this inventory. It does appear that the roadways required reconstruction with new rails and paving; and that the amount stated was actually paid by the investors is undisputed, making their investment nearly nine million dollars. How much of this may be defined or apportioned as the amount which was both "really and necessarily" invested in the enterprise" (vide *Covington, etc., Turnpike Co. vs. Sanford, supra*) I have not attempted to ascertain, except to this extent, that I am clearly of opinion that at least two million dollars of these preliminary expenditures are entitled to equitable consideration, as so invested beyond the reproduction value, if the valuation of the investment is not otherwise found sufficient for all the purposes of this case; but no opinion is expressed in reference to the remaining \$1,885,644.

(3) The final inquiry whether the net earnings shown are in excess of or equal to a just return upon the investment, presents no serious difficulty under the premises above stated.

Assuming five million dollars as the basis of investment the ratio of earnings would be as follows: (1) At the extreme computations of defendant the yearly average would be \$364,000, which would yield 7.2 per cent; (2) at the complainant's figures, after adding the corrections for taxes, the return would be 3.3 per cent; (3) at the amounts which are above stated as my deductions from the testimony, the yearly average being \$228,333, would make 4.5 per cent.

Assuming seven million dollars as the basis, the ratio of earnings would be upon each of said version as follows: For the first, 5.2 per cent; for the second, 2.3 per cent; for the third, 3.2 per cent.

The interest rate fixed in the bonds issued by the company is 5 per cent; the rate which prevails in this market, as shown by the uncontroverted testimony, is 6 per cent for real estate mortgages and like securities. If the five million basis be adopted, surely a better rate must be afforded for the risks of investment than can be obtained on securities of this class, in which there is no risk. Upon the basis of seven million, which is more logical and just, the 5 per cent named in the bonds is clearly not excessive, and should be accepted by a court of equity as the minimum of allowance; and even upon the defendant's partial showing the return would be less than one-quarter per

cent above that, with the large margin for depreciation left out of account.

I am of opinion that the testimony is not only convincing in support of the material allegations of the bill, but is uncontradicted and conclusive that the improved service received by the public, with the universal system of transfers, is well worth the 5 cent rate charged therefor; that the company has not received earnings in excess of an equitable allowance to the investors for the means necessarily invested in furnishing such service; that enforcement of the ordinance would deprive complainants of property rights by preventing reasonable compensation for its service; and that, therefore, the ordinance clearly violates the constitution of the United States and is invalid. Decree must enter accordingly, and for an injunction as prayed in the bill.

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### UNION STREET RAILWAY STATION IN WASHINGTON.

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When the Capital Traction Company, of Washington, D. C., extended its line in M street, about 18 months ago, to the north end of the Aqueduct Bridge, which connects with Virginia, and affords the only convenient means of access to Fort Meyer (the government cavalry station) and contiguous territory, one of the conditions was that the station building at the terminus of the line should be such as to admit of its use by other lines for car storage and for a passenger depot. The most available site for this union station was the west half of the block bounded by Prospect avenue, 35th, M, and 36th streets; this is on a steep hill directly north of M street, the rise being 60 ft. in the block which is only 250 ft. long.

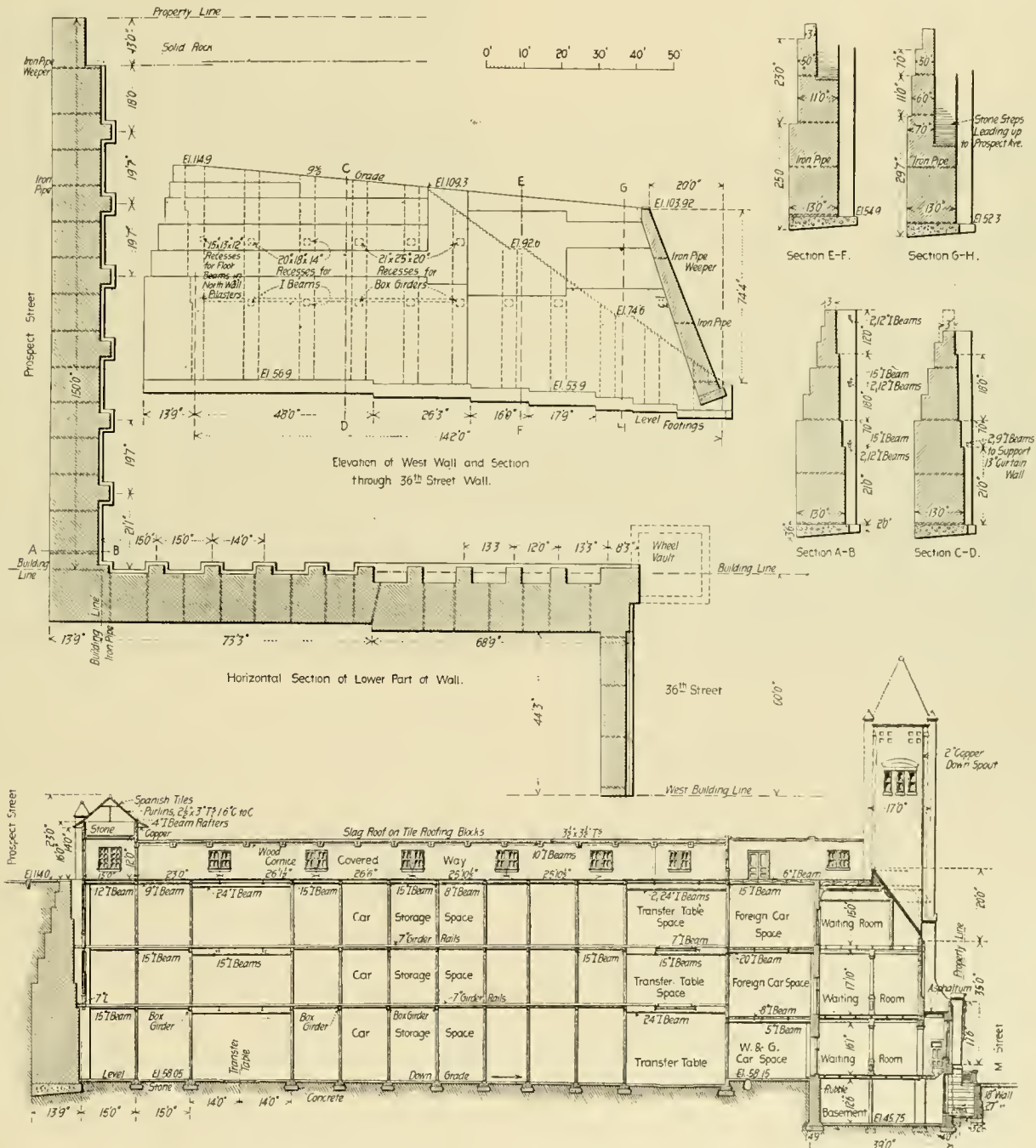
To give as much room as possible for the storage of cars, the Building Department permitted the retaining wall along Prospect avenue to be built under the sidewalk as an "area wall," and the wall of the building is on the property line. After some discussion between the company's architect and the city Building Department as to dimensions it was decided to build the retaining walls of concrete, 13 ft. thick at the base, with brick pilasters 4 ft. x 4 ft. at intervals of from 13 to 20 ft. As an additional precaution box girders were used on the second and third floors abutting against the east and west walls, thus bracing them against each other. These girders were figured both as columns and as girders to resist, besides the strains from floor loads, a thrust of 200 lbs. per sq. ft. of wall surface. Girders and I-beams were built into the pilasters parallel to the walls upon which the curtain walls were built to form the exterior of the building. In this way "areas" were left between the curtain and retaining walls which serve the double function of ventilating shafts and light wells. The inclined wall forming the foot of 36th street, and that portion along the stairway were built of squared rubble (Blue Gneiss) for appearance sake. With the exception of this street wall the walls were all built in trenches; that is, the proper location of the walls being staked out three trenches, intersecting at right angles, were started and carried down to about 3 ft. below the level of the finished first floor. The rock in the trenches was solid and almost without seams and had to be loosened by blasting, and this was true of the entire mass over the whole site except for a few feet of surface soil and rotten rock on top. Against the interior face of the trench walls wooden forms were placed and concrete was filled in, the pilasters, already mentioned, being built at the same time of hard cherry brick laid in 2 to 1 Portland cement mortar. The actual rock face formed the other side, and all irregularities and cavities



made during excavation were filled in solid with concrete. As the filling-in progressed numerous "weepers" of 2-in. wrought-iron pipe were placed in the wall. After the removal of the framing the east wall, which was to be exposed to view from the interior of the building, was given a coat of cement plaster. After the completion of the walls the excavation of the interior portion was begun. In this work some 90,000 cu. yds. of material, nearly all rock, was drilled, blasted and hauled in wagons across the river and dumped upon the south approach of the Aqueduct Bridge. The excavation measured from outside of west wall to outside of east wall about 194 ft., and was about 247 ft. the other way.

The building proper is three stories high, 242 ft. deep, and has a front of 180 ft. It is built of brown mottled brick,

with white stone trimming and steep-pitched red tile roofs. The tower, which contains passenger elevators, is 140 ft. high, and is capped with a steep red tile roof. The flat roof of the portion used for car storage is on the level of Prospect street in the rear, and was designed with an idea of its possible future use as a summer roof garden. In the center is a covered passageway leading from the Metropolitan railway on Prospect street to the elevators in the tower. That portion of the building facing on M street is devoted to terminal offices of the various railways, and waiting and toilet rooms for passengers making transfers. These rooms are handsomely finished in red oak wainscoting, delicately-tinted walls, panelled ceilings of stucco with rich corners and decorations, granata floors, ornate black iron grills and stair



UNION STATION OF THE CAPITAL TRACTION COMPANY, WASHINGTON, D. C.

railings. The entire lower floor is occupied by the terminal arrangements of the Capital Traction Company.

Directly in the rear of the waiting rooms, on all three floors, are long corridors, 25 ft. wide, with space for two car tracks and necessary switches for the use of foreign cars which may enter the building. These will be brought in on steel trestles, those from the lower level onto the second floor, and those from the higher level onto the third floor, the lay of the land in the vicinity being such as to make this possible. As most of the suburban lines during the hours of slack traffic run their cars at comparatively long intervals, it is believed that the Union Station will prove a great convenience. In the rear of the waiting rooms and track space already mentioned are located the car storage portions. This space is the full width of the building and 177 ft. long, and except for a central light shaft, 19 ft. 7 in. wide, the space from ground to roof is occupied by the storage tracks, 12 in number, on each floor. Transfer tables across the entire width at either end and car elevators are also provided. The floors in the car storage portion are somewhat novel. In this work 7-in. 85-lb. grooved girder steel rails are used, spaced 4 ft. 10 in. c. to c., resting upon I-beams. Between the rails the Ransome system of concrete fireproof flooring was built. This floor weighs 28 lbs. per sq. ft., and was calculated to stand a safe load of 175 lbs. per sq. ft. Previous to its adoption a test was made to determine its strength; it failed under a load of 12,160 lbs. resting upon a block which has an area of 1 sq. ft. The final failure of the test floor resulted from excessive deflection.

The entire work of design and construction was under the direction of D. S. Carll, chief engineer and superintendent of the Capital Traction Company, and Waddy B. Wood, architect. The foregoing data and the illustrations were taken from the description of the station published in a recent number of "Engineering News."

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### OPENING OF THE INTERNATIONAL STREET RAILWAY.

The first international electric railroad between the United States and the Dominion of Canada has been opened across the Niagara river at Niagara Falls on the new upper steel arch bridge, the tracks being controlled by the Niagara Falls Park & River Railway of Canada. This railway is destined to be another tie in the bond of union and friendship which has grown to such magnificent proportions between the peoples of the United States and Dominion during the present year.

The first electric car to cross the Niagara chasm on its own wheels and by its own power was car No. 19 of the Niagara Falls Park & River Railway on the evening of Thursday, June 30; the hour was about 7:15 p. m. Few people were aware that the important event was to occur, and so the passage of this first car was witnessed by but a small number of persons. The conductor in charge was John Barker, and the motorman was R. W. Murray. The car was decorated with the Stars and Stripes and the Union Jack. About 7 p. m. the car ran through the switch from the main track of the road on the Canadian side, and onto the one completed bridge track. It was boarded by J. C. Rothery, superintendent of the road; Manager Phillips, Superintendent Dill and Treasurer Bostwick of the bridge company, John Bost-

wick, Engineer R. S. Buck, S. J. Smythe, president of the bridge company, John Houp, foreman of the bridge work, and representatives of the press. The new track on the bridge was found to be very smooth and all the officials were delighted. The car was placed in regular service that evening, and on Dominion Day, July 1, and on July 4th, carried a very large number of people. It is evident that the regular patronage of the car will be heavy.



THE NEW NIAGARA BRIDGE.

At present a stranger's ticket to cross the bridge will entitle him to a ride across the bridge in the car without paying extra fare, but citizens will be forced to pay an additional 5 cents, owing to the fact that residents cross the bridge at a cheaper fare than strangers. The opening of the bridge road is another link in the proposed belt line around the gorge.

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### SUNDAY CARS IN CANADA.

At Toronto, June 15, County Judge McDougall quashed the indictment against the Toronto & Mimico Electric Railway Company for running cars on Sundays. The decision is due to the finding that the indictment was faulty in two particulars. It was based on a section which is an amendment to the Lord's Day Act, and then asks for a penalty as provided under the criminal code, which, the judge holds, cannot be consistent, as the breach of the statute should be punished in accordance with the provisions of the Lord's Day Act, but as there is a difficulty in bringing up a corporation under the latter act, according to the holding of Judge McDougall, the point will probably be carried to the court of appeal for adjustment. It was also found that the prosecution was delayed beyond the statutory limit.

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The common council of Salinas, Cal., has passed a resolution declaring its intention to grant a 20-year franchise to the Salinas Railway Company, allowing the use of the steam motor.

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The conductors employed by the Cincinnati & Miami Valley Traction Company have petitioned General Manager Wagenhals to establish white duck suits as the regular uniforms during the hot summer months.



## A MARYLAND INTERURBAN.

The Frederick, Thurmont & Northern Railway Company is the name of a projected electric interurban which is to run from Frederick, Md., 30 miles north through Thurmont to a point on the Pennsylvania line near by the famous Gettysburg battlefields. The road is to be a connecting link between this historic place and Washington, D. C. It will pass through the richest and most beautiful sections of Frederick county and connects two towns of 1,200 inhabitants each. The power station will be located at Thurmont, and the construction work will be pushed with vigor. The officers are as follows: Col. L. V. Baughman, president, Frederick; Isaac S. Annan, first vice president, Emmitsburg; Alex. Ramsburg, second vice president, Lewistown; Charles C. Waters, secretary, Frederick; Dr. F. B. Smith, treasurer, Frederick; R. A. Rager, engineer, Frederick, and Wm. H. Hinks, counsel, Frederick.

## STREET RAILWAY NOTES FROM THE ANTIPODES.

From Our Own Correspondent.

The death of William Don, the workshops manager for the Melbourne Tramway Company, occurred on March 8, 1898, after a rather prolonged illness. The deceased was born at Brechin, Scotland. In 1866 Mr. Don emigrated to the United States, where he was engaged for 18 years in street railway work. After filling many important positions in American street railway workings he came to Australia in 1884 under contract to the Melbourne Tramway Company, for which concern he superintended the erection of the present car and machine shops and also the making of the cable cars and dummies that are now in general use in this city.

Mr. Don was thoroughly respected by all in the company



STREET RAILWAY TRAIN IN BENDIGO, VICTORIA.

## NEW QUARTERS FOR BOSTON ELEVATED.

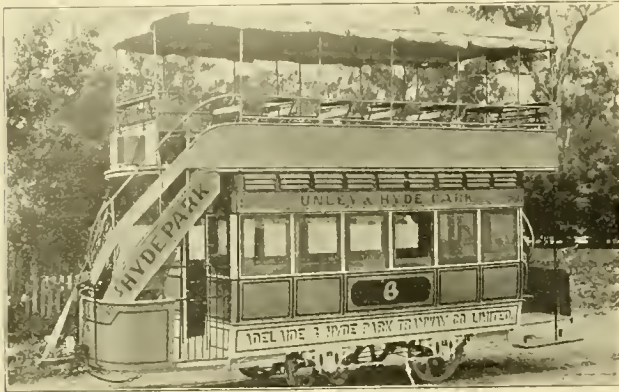
The company has moved its offices from the cramped and narrow rooms in which a portion of the business of the West End Company has been carried on for more than ten years to the spacious quarters in the Converse building at the corner of Milk and Pearl streets. The company occupies eight of the ten stories in the building, thus affording ample room for the immense work which the company will have to carry on and allowing it to concentrate its entire force, which was scattered around in no less than five buildings all over the city, into one building. The new building is considered an excellent location for the offices of the company. The rooms are all well lighted, airy and cheerful, and equipped with all modern appliances of the most approved character.

The Montpelier (Vt.) & Barre Electric Railway was opened on June 28.

and well liked by all the employes at the works, and as a mark of true respect and good feeling in which he was held by all with whom the deceased had business and other connections there were fully 350 persons in attendance at the funeral.

In Adelaide, South Australia, the horse car is the only street railway conveyance at present. There are several private companies but the lines are old and worn out and are equipped with antiquated rolling stock. I hear on authority that the Government of South Australia intends to take over the street railways and equip them for mechanical traction, probably for electricity, though this has not as yet been decided. So there is hope yet that the third important capital in Australia will "get into line" and be worthy of its name and have a creditable street railway system. At present the firm of Duncan & Fraser, of Adelaide, does all in the car building and repairing line for the various companies, for

whom in the first place they built the cars. An Adelaide car is shown in the accompanying illustration. This firm is a large importer of American woodwork and ironmongery



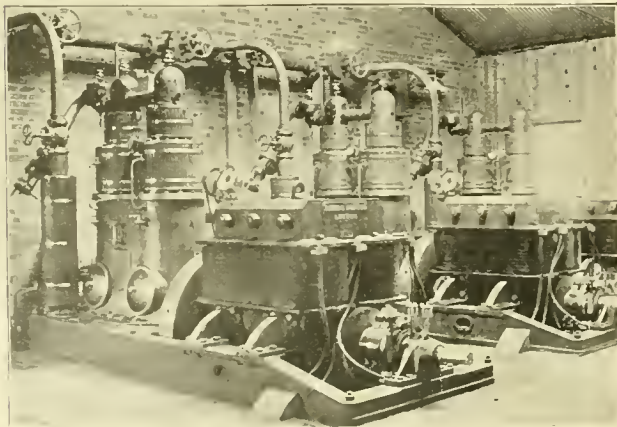
CAR IN ADELAIDE, SOUTH AUSTRALIA.

for the construction of all kinds of vehicles for light and heavy draught.

During a brief visit made recently by your correspondent to the island colony of Tasmania (long known under the name of Van Dieman's Land) a call was made at the depot of the Hobart Electric Tramway Company for the purpose of inspecting the plant. These privileges were readily granted to me by the genial gentleman, A. C. Parker, who is the general manager for the company. After looking over the power station and grounds I was supplied with photographs of what I had seen and some notes upon the line in general.

The Hobart Electric Tramway Company, Ltd., is now nearly six years running; the Siemens overhead electrical contact system is employed. The generators are coupled to Willan's central valve engines. There are four Marshall boilers of the multitubular type; only two of these are used at the one time, thus allowing for the cleaning of two while the others are in use.

The total length of single track laid over the three sections up to the present is 9 miles. There are 20 cars used in the service; each car is capable of seating 48 passengers, but at times the cars are taxed with as many as 110 persons in and on each car.



INTERIOR OF POWER HOUSE, HOBART, TASMANIA.

Some of the grades of roads immediately out of the "city center" of Hobart are very steep, and a grade of 1 in 16 is not unusual around the Tasmanian capital and first port; this is evidence that the actual working part of the system is thorough and complete in detail. While outside Hobart one day I watched one of these cars mount a 1 in 16 grade having from 50 to 80 passengers aboard; the progress was rather slow with the electric car, but it was certainly what many horses only could have accomplished with severe strain and at a walk. A remarkable fact is that during all the time the company has been running its cars no accidents or stoppages have occurred.

The total population of Tasmania was on December 31, 1896, estimated at over 166,000; Hobart, the capital, had 24,000, and Launceston, second city and port of the colony, 17,200.

Launceston is the only city in Australia that has water power available for lighting and power purposes and the lighting plant there is so driven. It is said that there is suf-



IN FRONT OF POWER STATION, HOBART.

ficient power at the local falls, known as the Cascade Falls, for driving machinery to work a street car system, which at present is entirely lacking, the residents having only dirty cabs or wagonettes as public street conveyances to go from the city to the suburbs and for use in the city itself.

Hobart has only gas for its illuminant, but I find soon there will be an electric lighting plant installed (the machinery from England and America is now out on the road) by the local gas company, which had, I noticed at time of my visit to the Tasmanian capital, in course of erection a brick power house and necessary buildings for the new undertaking and which were being prepared to place the machinery directly it arrived.

The work of putting down the new electric line in George street, Sydney, N. S. W., is being done at a snail-pace, and it is as clear as daylight that the contractors (who should have had all completed by end of 1898) will not have finished laying down the new system till within about a year after their contract time.

Bendigo, Victoria, is the only city or town outside Melbourne that has a mechanically worked street railway in that colony. The city in question is the first one of importance in Victoria with respect to gold output ever since that field was opened.

The Bendigo Tramways Company, Ltd., is purely a local concern of local capital and enterprise. Much of the car material used by the company is from the United States. There



are five steam motors built by the Baldwin Locomotive Works, of Philadelphia; three other steam motors engaged on the line are from the Phoenix Foundry, Ballarat, Victoria. There are 14 passenger cars, most of them being on



SCENE ON THE HOBART ELECTRIC TRAMWAY.

double trucks; they were constructed originally for an electric accumulator system, which was tried first in Bendigo, but was found to work unsatisfactorily, owing chiefly to the very heavy grades (over 1 in 16) on some parts of the road traversed. The cars can carry 60 passengers each, but are seldom taxed to that capacity, as Bendigo, like the whole colony of Victoria, suffers for want of an industrial "work-while-you-can" population. The fuel used by this company is coke, which is found to be clean and not more expensive than coal.

F. W. N. KING.

## APPLICATION BLANKS.

Application for the position of motorman on the cars of the Chester (Pa.) Traction Company is made by filling out the blank, the items of which are given below. A similar blank is used for conductors. The questions cover every important point of information about an employe which it is desirable for the officials of the company to keep on file. Each applicant must be vouched for by two citizens of Chester, to each of whom the company sends one of the second blanks. These forms have been recently adopted by John MacFayden, superintendent of the Chester Traction Company. On the blanks there is ample room after each question for an answer in writing.

Chester, Pa., ..... 189..

CHESTER TRACTION COMPANY.

Sir:—I, the undersigned, respectfully ask to be appointed Motorman, and, therefore, state as follows:

1. My full name is.....
2. I was born at.....
3. I was.....years old on the.....day of....., 18...
4. I now reside at....., and have lived there.....
5. My last previous residence was....., and I lived there....
6. I have resided in Chester since.....
7. I am a single—married—man, and have to support myself, wife and..... children, and.....
8. Do you use intoxicating liquors?.....
9. My trade and occupation is.....
10. I was employed last by.....
11. Is it your intention, if appointed Motorman, to continue permanently in the service of the Company, and to discharge all duties faithfully and honorably?.....

12. Are you a citizen of the United States?.....
13. I refer for recommendation of my character to the following persons:

NAME.	ADDRESS.
.....	.....
.....	.....

14. I have had the following experience in railroading:.....
- My reasons for leaving my last position were:.....

\*The undersigned, each for himself, certifies, on his honor, that he has known the above named..... for.....years last past; that he knows him to be the same person who executed the foregoing statement; that he is well acquainted with his habits of life; knows his present place of residence; believes the aforesaid statement signed by him to be strictly true and correct, and vouches for and endorses him as honest, sober, steady and industrious.

\*To be signed by two citizens of the City of Chester, with their occupation and place of residence.

General Appearance. Weight. Height. Complexion. Hair. Eyes. Remarks:.....

N. B.—This application must be returned to the company's office within one week from date, or it will be canceled.

### CHESTER TRACTION COMPANY.

General Superintendent's Office, Strictly Confidential.

Chester, Pa., ..... 189..

Mr.....

Dear Sir:—Mr..... has made application to me for the position of..... on this Company's lines, and as we understand that you know of him and his habits, we take this means of requesting your opinion as to his responsibility, by answering the questions found below. The men employed by this Company in the moving of their cars will have entrusted to them the comfort and safety of our patrons, and we wish to employ only sober, honest and trustworthy men. We ask your assistance to this end, and assure you that your replies to these questions will be treated as a personal matter and will not be made known to applicant. Thanking you in advance for the favor I am

Respectfully yours,

.....Gen'l Supt.

How long have you known this man, and under what circumstances?

Can you vouch for his honesty and truthfulness?  
Does he gamble, or associate with loose women?  
What is his reputation in the community? Is he industrious and reliable?

Does he use intoxicants? Has he ever attended bar?  
Is he loud-mouthed or profane?

Have you any knowledge of his being discharged from a former position? Give full particulars.

Is he, to your knowledge, afflicted with any physical disability or incurable disease?

Has he ever been placed under arrest? If so, give full particulars.

What do you know of his associates?  
Can you recommend him as worthy of the confidence of this Company, and one to whom the care and welfare of their patrons may be safely entrusted?

(Signed) Name.....

Date.....189.. Address.....

The Brooklyn Heights Railroad Company, Brooklyn, N. Y., was robbed of \$1,000 at the Halsey street depot, June 2. When the strong box, in which the depot receipts are kept, reached the bank and was opened it was found to contain nothing but old brass. One of the employes of the road is suspected of the theft.

**THE ZERMATT-GORNERGRAT MOUNTAIN RAILWAY.**

One of the most interesting and instructive railway undertakings of the year is the Zermatt-Gornergrat mountain railway operated from a three-phase alternating current circuit. Zermatt is a small village of 500 inhabitants in the Canton of Valais, near the southern boundary of Switzerland and on a branch of the Jura-Simplon railroad. It is at the base of the Gornergrat and is a favorite resort for tourists. This project was conceived shortly after the Jungfran railway, both of which have excited world-wide interest.

The question of power was of primary interest, but the numerous waterfalls made the application of electricity desirable. After the engineers had studied the problem it was decided that polyphase alternating currents would prove most economical in transmission and the use of three-phase motors on the locomotives was advocated. Brown, Boveri & Co. had made the plans for the street railway system in Lugano and were satisfied with the operation of the alternating current motors on the cars. A test was then conducted on a portion of the new Gornergrat railway which fully justified the adoption of the motors on the new line. The objection to two trolley wires over each track is not a serious one with the mountain road, as the speed of the cars does not exceed 5 miles an hour, and the road passes through no thickly settled places.

Fig. 1 is a map of the line and a profile of the roadbed. Beginning at Zermatt it extends 5.7 miles to the summit of Gornergrat, which is 10,791 ft. above sea level. The first 1,000 ft. of track is level; it then crosses the Visp on a bridge of 98 ft. span. From the bridge there is a grade of 12 per cent for nearly a mile and the road crosses over the Findelbach. About 300 ft. below this bridge is the power station, as shown in Fig. 2. After crossing this bridge is a

The "Zeitschrift für Elektrotechnik," of Vienna, gives the following information in reference to the design and construction of the road. Each train will consist of an electric locomotive and two cars with a capacity of 110 passengers. This makes the weight of a train unit about 30 tons. There

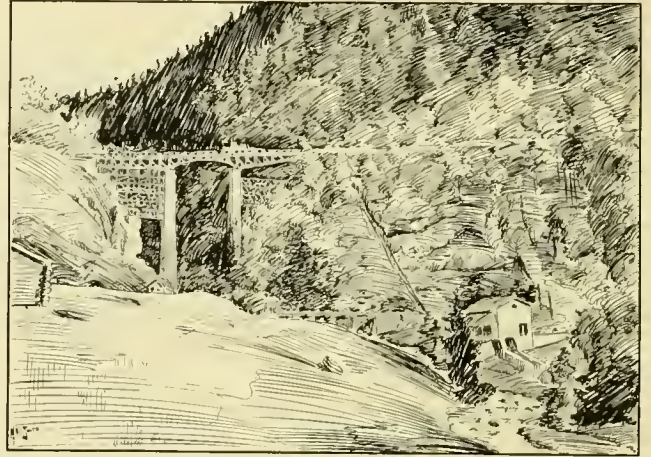


FIG. 2.—POWER STATION.

will be three trains in operation on the line and it is calculated that 160 h. p. at the motors will be required for each one. If there are three trains in service there will be one at least going down while the other two are ascending. Assuming an efficiency of about 60 per cent for the generators, transformers, transmission and motors, 510 h. p. should be developed at the turbines.

It was decided to install three 250-h. p. water wheels of American make direct connected to generators through flexible couplings. The speed is to be 400 r. p. m. The water wheel governors are very sensitive, keeping the speed constant with variations in the load of 50 per cent. The head of water available is 330 ft.

The alternating current generators have stationary armatures and 12-pole rotating field magnets. The current is generated at 5,400 volts with a frequency of 40 cycles per second. The field current for the alternators is generated by 15-h. p. direct current dynamos coupled direct to the shafts of the alternators.

The current is transmitted to the various transformer stations at the voltage generated and reduced to 540 volts for distribution on the line. There are three of these stations, each of a capacity of 180 k. w. The current is transmitted from the power station on three wires of No. 3 B. & S. gage; this line does not follow the road but takes the shortest cut across the country. The voltage is reduced to 540 volts at the transformer stations and passes to the line through feeders of No. 0 wire. The two trolley wires are suspended 16 in. apart above the center of the track and the rails form the third branch of the circuit. Chicago rail bonds are used in connecting the rails.

From an electrical standpoint the details of the locomotive are of greatest importance. Fig. 3 shows the truck with the motor and gears mounted thereon and Fig. 4 is an outline drawing of the parts of the locomotive. There are two synchronous three-phase 90-h. p. motors for each locomotive. The motors have wound armatures or rotors, contact rings, six poles and a speed of 800 r. p. m. The reduc-

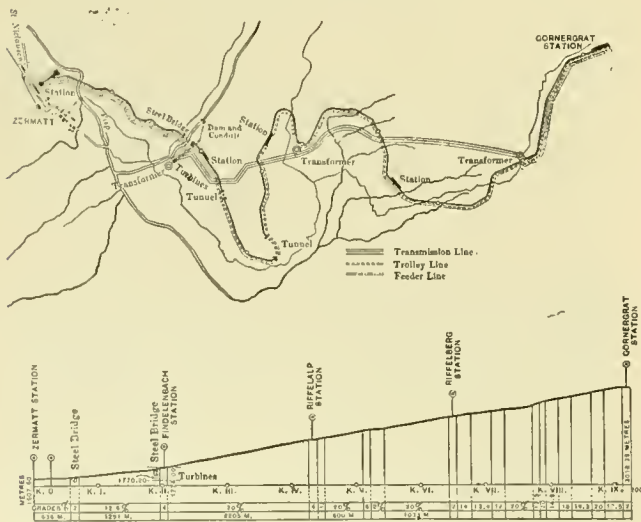


FIG. 1.—MAP AND PROFILE.

grade of 20 per cent which, with exception of the stations and a few stretches, continues to the end of the line. At five points along the road tunnels had to be driven, the longest being 380 ft. The total rise in the whole distance is 6,849 ft. The rails used are 4-in. Vignolles and between them an "Abt" rack is fixed. The track is 3 ft. 3 3/8 in. gage.



tion through the gearing is 12 to 1. Above the motors is arranged a resistance common to both and the speed is controlled by cutting this in and out of the rotor circuit. Above the rheostat is a switch for opening the car circuit. There is a double set of current collectors on top of the car to provide for the heavy currents taken at times. The motors are mounted on the truck, as shown in Fig. 3 (one motor is not in place), with pinions at either end of the shaft which engage with the two large gears, which in turn drive the gear on the axle. There are two driving axles and each motor works separately upon an axle.

Owing to the excessive grades extreme precautions had to be taken with the brakes and two independent sets are provided. The first system is operated by hand and each can be applied by hand upon the two driving axles independently of each other. The friction band brakes applied to wheels on the motor shafts, see Fig. 3, are operated by one of three different ways: by hand; automatically, so soon as the car exceeds a certain speed; and whenever the current is interrupted from any cause. This is accomplished by means of a solenoid which, so long as the current is passing through it, loosens the brake but throws it on the instant the current stops. The motors also have a powerful braking effect.

In going down grade the motors can be controlled in two different ways. They may be connected in the same manner as going up grade with the resistance inserted in the rotors or the rotor windings may be short circuited. The train has the same speed going down hill as going up; they have to keep in step or in synchronism with the alternators. The motors act as generators going down hill and return current to the circuit. It was necessary to make provision for this at the power station, for if all the trains on the line were descending the locomotive motors would generate so much current that the alternators at the station would run as motors from the line currents. A load resistance is automatically inserted in the circuit when the alternators exceed a certain speed.

The fact that the motors will return energy to the line

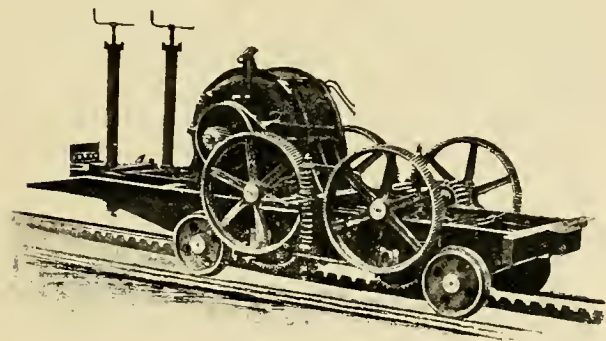


FIG. 3.—TRUCK.

was demonstrated by experiments last November on a completed portion of the line a mile in length. During the tests a fully loaded train was run down hill with the motors connected as generators and the train maintained the same speed as in going up grade without any application of the brakes. The excess current was absorbed at the power station by a water rheostat. The test also showed that a locomotive hauled a fully loaded train over every grade evenly

and smoothly, and when the rotor resistance was out of circuit the speed was independent of the grade or load.

The cars, station, buildings, etc., are all lighted by electricity, there being small transformers at the stations to

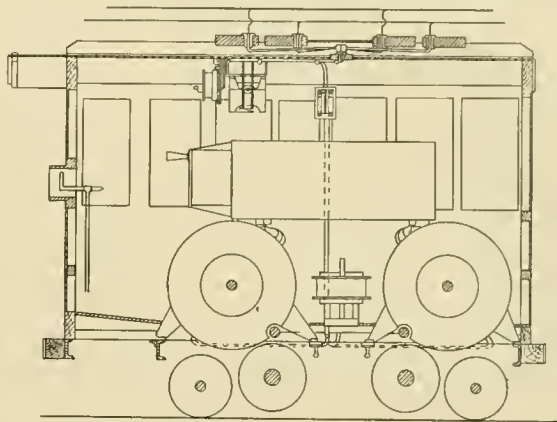


FIG. 4.—LOCOMOTIVE.

reduce the transmission voltage to 540 volts. The lamps on the cars are connected three in series. This important work will be completed by July 1 and will be the first electric rack railway driven by three-phase alternating currents. However, this will be followed in a short time by several similar roads, such as the Jungfrau and the Stansstadt-Engelberg. The successful operation of the Lugano street railways and the preliminary tests on the Gornergrat indicate that multi-phase alternating currents can be employed both in the operation of mountain roads and ordinary street railways, and there may be important developments in the future along this line.

#### CLEANING CAR GATES.

Previous to the building of a large barn this spring many of the cars of the Calumet Electric Street Railway Company, of Chicago, were constantly exposed to the weather. In preparing for the summer traffic no less than 175 cars were to be overhauled and painted. The gates on these cars were covered with rust which proved very difficult to remove. A rattler was designed by the master mechanic, W. A. Harding, and made in the repair shop. It is 30 in. square and 22 ft. long with bearings at each end and a disk support in the center. The rattler is constructed of 2-in. planks reinforced by wrought iron bands. The bearing at each end consists of a short piece of pipe secured to the end of the box and bearing in old motor brasses. An old W. P. 30 motor with double reduction gears furnishes power to rotate the rattler. One side of the box is removed and 13 gates inserted, each separated by a wooden strip. A ton of gravel is in the box. The side is bolted on and the motor started operating the rattler at 12 p. m. The rattler is run all day with one charge of gates, and when they are removed every trace of rust is gone. The actual cost of the machine was less than \$30 and it will easily save its cost in labor.

It is again reported that plans are brewing for the consolidation and sale of all the street railways in Seattle, Wash., but no definite announcements have as yet been made.

## SOME GRAPHICAL DIAGRAMS USED IN THE OPERATING AND ACCOUNTING DEPARTMENTS.

The manager of a business must be familiar with the details of all departments and with the effect which a change in the details will have upon general results. Wastes and useless expenditure occur in the details; a comparison of general results may show their existence because in the aggregate they amount to a large sum, but to tell just where they lie and how to curtail them the details themselves must be examined. All results in operation or accounting appear at one time or another as figures, and when called upon to analyze a mass of figures and from the many facts thus expressed draw inferences and formulate rules for future guidance a man needs all the labor saving devices that can possibly be brought to his aid. Mere numbers cannot, especially if they be of considerable magnitude and there are many of them, convey their full meaning to the average mind. The most effective way of showing relative magnitudes is by plotting them to scale and if they follow or do not follow a regular law of variation the fact is readily made apparent when the locus is drawn.

The value of graphical diagrams in all experimental scientific work is too well known and too highly appreciated to require any demonstration. With the scales of the rectangular co-ordinates aptly chosen the resulting diagram speaks volumes; it serves to check the work and to show where lie the critical points which may with profit be further investigated.

In the power house the readings taken from the volt, ampere, and watt meters at frequent intervals during the day give a sheet full of figures which require time and much mental arithmetic to appreciate. When these same figures are plotted, showing the changing value of these quantities as the time varies, the eye takes in the result at a glance. Continuous graphical records of these quantities and also of the engine speed are quite commonly taken and in many instances duplicate recording instruments are upon the desk of the manager as well as upon the switchboard.

Generators and motors have their "characteristics" and engines their efficiency curves, which are the graphical expressions of the physical laws in accordance with which they act, the result of experience, thus shown because more convenient to apply than when shown in tabular form, or the curve expressed by an equation.

To show the receipts, the various expenditures, etc., for a given year and compare them with similar items for previous years nothing serves better than curves.

Above all the use of diagrams permits a condensation that can be obtained in no other way, and the results from operation for a period of 10 or 20 years may be shown on single sheet where they are readily accessible and easily comprehended.

In what has preceded reference has been made to only the most common form of diagrams; i. e., those in which two variables are taken as co-ordinates and a line drawn through the several points when located, the form and position of the line showing the relation that successive values of the quantity plotted have to each other, as well as their absolute values. But colors as well as forms appeal to the eye and there are many diagrams in which use is made of them. These are rather to make a convenient record of facts, than for comparison. Thus in keeping permanent

records of car repairs different colors may represent light repairs, heavy repairs, varnishing, repainting, etc.; each individual car having a line to itself designated by its number, the other dimension of the paper is available for a record of time.

Closely akin to diagrams is the car board where by means of numbered holes and colored pegs or tags, or of colored and numbered blocks, a record, temporary in character, however, is kept of the rolling stock.

Such schemes for exhibiting the condition, earning capacity, cost of operation, etc., and the general history of the motive power and car equipments have been used on nearly all steam roads, each road generally working out its own system. These records to be of value must be kept up to date and the weak point in the system has usually been that the clerk had other duties also, and the record must wait until there was nothing else to be done and was generally a month or more behind. Also when the earnings fall off and it is necessary to decrease the office force, the record clerk is among the first to go and among the last to return when business improves.

It may in some instances be urged that the time spent by the head of the department in referring to the original records and which might be saved by the use of graphical digests is not more valuable than the time of the clerk who makes the diagrams. In other words a \$200 man might spend one-fourth of his time hunting through original records and the company be no worse off, if the services of a \$50 man could thereby be dispensed with. But this argument we do not believe is a serious one.

In a paper read before the Northwest Railway Club some time since by Tracy Lyon, master mechanic of the Chicago Great Western Railway, treated of the application of graphical charts to railway records as developed by that road. Each department carries a series of running charts covering the figures in which it is most interested. One is the monthly sheet, so called, covering in its width 10 spaces, each representing a year and subdivided into months, on a scale of one year to 1½ in., and with 30 horizontal lines to the inch, each fifth and twenty-fifth line being heavier for convenience in counting. The other is the daily sheet, which differs only in that its width covers one year instead of 10 and there are vertical lines for each day, with heavier lines each fifth day and at the beginning of each month. Upon these sheets are plotted all sorts of things, and they are valuable for reference and furnish an ideal index for a great deal of matter that is usually not to be got at.

For the pay roll data some 40 monthly sheets are bound together and on the first page is plotted the total amount of the pay rolls of the department for each month since 1890. On the next page, month by month, are plotted in groups three general subdivisions of this total, covering the pay roll of the principal shops, division stations and smaller stations respectively. On the following pages are shown still further subdivisions, including the total pay rolls of each department in the shops and each station by itself. Each one of these is carried out again by showing, grouped together on succeeding pages, the amount paid to each class of men in each department of the shops and at each station. This makes quite a book, but imagine the relief in having such



a map of present and past events to turn to when some question is brought up involving the amount of money which it is justifiable to spend at a certain point. The alternative of a pile of dusty old pay rolls, anywhere up to a foot high, is not pleasant to contemplate and somewhat hopeless. The diagrams, on the contrary, show at a glance just how many hostlers or car cleaners, for instance, there have been at a given station at any time for years back and just what wages they have received.

There are six different things that the master mechanic wishes to know about his locomotives: 1. When turned

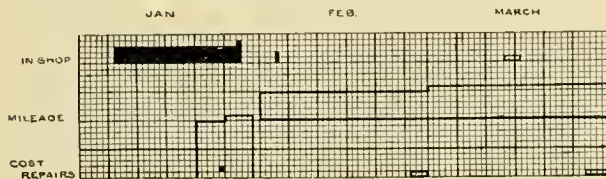


FIG. 1.—RECORD OF ENGINE.

out of the shop and the extent of the repairs made. 2. The cost of these repairs. 3. The mileage per month. 4. The times when taken out of service for repairs. 5. The cost of running repairs. 6. The number of failures against the engine. Fig. 1 shows an individual engine diagram: The shop record and failures are shown in the upper portion of the sheet, the character of the mark indicating the extent of the repairs and its position the date or dates when a failure occurred or when it entered or left the shop. Mileage made is indicated by a horizontal line drawn at the proper distance above the mileage base line. The cost of repairs is shown by enclosing the requisite area in the lower right hand corner of the space allotted to the month, each small square representing \$10.

Fig. 2 shows a record of the shopping of coaches. Coach 211 was given a general overhauling (indicated by a block three lines high) between March 1 and the middle of April, 1896, and was painted and varnished, the old paint being

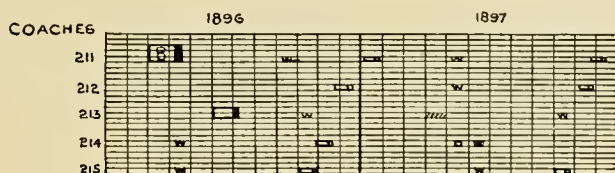


FIG. 2.—RECORD OF COACHES.

burned off (B). On January 1, 1897, eight months after, it received light repairs, being in shop for a matter of a couple of weeks, and was varnished only. The blackened edge to the right of the blocks indicates paint and varnish, the line alone varnish only. This car was washed with soap (W) in August and May, and was again shopped for light repairs and varnished in December, 1897. Coach 213 was taken in for light repairs in April, 1897, because of being damaged in service and before its usual time, the cross hatching indicating this. Coach 214 was held for a few days in May, 1897, for light repairs, but was not painted or varnished, only washed.

From such a chart one can obtain a very good idea in a few minutes of the probable condition of the equipment, and

if a car is neglected or overlooked, attention is quickly called to the fact. It is not necessary to draw off any figures to determine what cars are to be shopped during the coming month. A glance down the line is sufficient. It gives, too, as in the case of the engines, a permanent record of each car as well as a record of the number of cars shipped each month.

In the master mechanic's office of this road the records kept are:

BY MONTHLY CHARTS.

Pay Rolls—In summary and detail.

Coal—Cost per mile. Miles to 1 ton. Tons per 10,000 ton-miles. Percentage of excess over allowance by divisions.

Locomotives—Number in service. Number in store. Total mileage. Total cost repairs. (Labor. Material.) Cost repairs per mile. Failures—In detail. By divisions. By classes. By engines. Total. Number of engines handled at each roundhouse. Cost of handling per engine. Cost of wipers and dispatchers per mile. Cost of oil and waste per mile. (Different kinds of oil.) Miles to one pint and one pound. Cost of supplies per mile. Cost of sand per mile.

Cars—Cost of repairs, passenger cars and freight cars. (Labor and material.) Cost of oil per mile. Cost of waste per mile. Shopping of passenger cars. Shopping of cabooses.

Engineers—Each man's record. Oil—Good or poor. Coal—Percentage of excess over allowance. Marks or suspensions.

BY DAILY CHARTS.

Locomotives—Shopping, cost repairs, mileage, etc. Number held at principal shops for general repairs. Estimate of cost of such repairs. Number held each week at division shops. Number turned out each week at division shops. Washing out of boilers. Metallic packing used on each engine. Inspection of nettings and ash pans.

P. V. Burington, secretary and auditor of the Columbus (O.) Street Railway Company, has kindly furnished us with a sample diagram used by him for recording the number of passengers carried hourly on each of the company's lines. This "day card" as it is called has upon it in addition to the graphical record, the data from which the record was plotted as will be seen by examining Fig. 3. The figures under

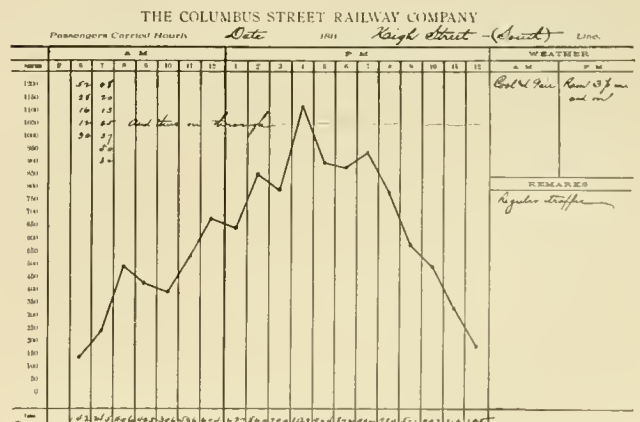


FIG. 3.

**THE COLUMBUS STREET RAILWAY COMPANY.**  
**CONDUCTOR'S DAY CARD.**

MAIN ST. and NEIL AVE.      Date                      1898.

Conductor No.                           Name                     

Running for                     

CAR No.	TRIP	TIME	S. Cl. Fares		TRANSFERS		Bag Tick. 25	Free Tickets	Total Passengers	CASH		D. B. Police & Taxes
			Gold	Exc. 4	Dol.	Cts.						
	Out 1											
	In	M										
	Out 2											
	In	M										
~~~~~												
	Out 17											
	In	M										
	Out 18											
	In	M										
~~~~~												
TOTAL.												

CASH.		Dols.	Cts.	REGISTER READING.		
5ct. Fares.	- - -			In No.	} Reg.	
3ct. Fares.	- - -			Out No.		
Total Cash.	- - -			Total		
Over.	- - -			In No.	} Reg.	
Short.	- - -			Out No.		
				Total		

O. K. \_\_\_\_\_

FIG. 4.

the hours are understood to mean 30 minutes each way. The locations of the points on the line are determined by the totals which appear under them.

The conductor's card (Fig. 4) has a column showing the time at which the car arrives at each end of its run, outward and inward; also, it shows the number of passengers, from which figures the day card is made up.

Mr. Burington writes: "We do not work up these sheets daily, but at such times and for such periods as we may desire to test the heavy or light loading of cars at certain hours. These sheets have been found of considerable value to us, in answering claims made that our cars were overtaxed, particularly in the usual busy hours of the day. In determining the question of overloading, the matter of a proper proportion of short hauls must be considered as a deduction from the total number of passengers carried any considerable distance."

For three years the Chicago City Railway has kept a permanent record of the shopping of its cars on large sheets of cardboard, suitably ruled for the purpose. There are 16 of these sheets placed in frames, two in a frame; the eight frames are hinged to one side of a closed cabinet, so that they may be swung out for inspection and at other times kept where they will be out of the way and not gather dust. Each frame (inside measurement) is 26 in. wide and 36 in. high. On these sheets each car is given two spaces about 3/4 in. square, each ruled into 16 small squares by finer lines, and the number of the car placed above it. The four horizontal rows of small squares represent the four quarters of the year and the row in which a mark is found indicates the quarter of the year in which the car was in the shop. The small squares in each horizontal row when colored indicate the nature of the work done on the car. Thus: black indicates construction; dark blue, reconstruction; green, repairs; red, painting; yellow, retouching and varnishing. When a car is built, it is given a space on the

board and the first square in the proper row painted black, the second red, and the third yellow.

Different kinds of cars, cable grip, cable trailers, closed motors, etc., have different sheets. It was mentioned that each car was given two squares; this is to keep the record for two years together. The 16 cards have sufficient room to show the record for four years for all the cars, and the arrangement of two years only on any one sheet gives at least a two years record of the cars at all times.

The same company has also a number of diagrams on which are platted each month data which experience has shown are often needed for reference. There are at present five sets of diagrams used; they are framed and hang on the walls of the superintendent's office. The frames are 20 in. by 33 in. inside measurement, and the diagrams 16 1/2 in. by 20 in. Cross-section paper ruled with lines 1-10 in. apart both ways with every tenth line heavy, is used for these diagrams. This scale is convenient for plotting the items which are always shown vertically; horizontally each month has a space of 1 in. allotted to it, though only monthly totals are plotted. This scale is found to be a very good one.

One set of diagrams, which we will call "A," show financial data by months for a period of three years, each year being shown by a line of different color. This sheet is divided by heavy horizontal lines into sections 2 or 3 in. wide and the following quantities shown, plotted to suitable vertical scales:

- Car-miles run.
- Gross receipts.
- Total expenses.
- Net earnings.
- Receipts per car-mile.
- Trainmen's wages per car-mile
- Total cost per car-mile.
- Per cent of operating expenses to total.
- Total cost of motive power.

The second set "B" is displayed in the same frame as "A," and was designed to show the expenses as distributed over the various departments. These sub-divisions were:

- Department of time tables (includes wages of trainmen, etc.).
- Supervisor, subdivided into: Street. Car House. Horses. Power houses.
- Track department.
- Track department, pay roll.
- Electrical department.
- Mechanical department.
- Mechanical department, pay roll.
- General office.
- Fixed charges.

This set served its purpose admirably until changes were made in the organization, when this subdivision was no longer suitable and only a few diagrams of this set are now kept up.

July, 1897, three other sets of diagrams were started showing power house and barn expenses in a similar manner.

Set "C" gives the cost of cable power on a car-mile basis, the items being:

- Fuel.
- Maintenance.
- Labor.
- Supplies.



Total expenses.

There are three cable power houses and different colored inks are used to distinguish them, as all three are placed on the same sheet. For different years different styles of lines (full, dotted, etc.) are used.

Set "D" exhibits the cost of electrical power on a kilowatt-hour basis, the items being the same as for set "C." Different colors of ink are used to distinguish the two electrical power houses

Set "E" shows the car house expenses, five colors of ink being used for the five car houses. The items shown are:

- Number of cars operated.
- Car-miles operated.
- Cars repaired at car houses.
- Total cost of material.
- Cost of material per car-mile.
- Pay rolls.
- Labor per car-mile.
- Material and labor per car-mile.

These various forms were worked out and arranged by President Bowen.

The Boston Elevated Railway does not make use of graphical diagrams in the accounting department, but a brief reference is here made to some of its blanks and forms, which we have received by the courtesy of H. L. Wilson, auditor of the company, because they suggested a simple diagram which would enable the data to be conveniently exhibited for purposes of comparisons extending over a long period.

The "schedule of operating expenses" furnishes an index to the accounts. A comparison of the operating expenses is kept in a large book and by an examination of it one can tell the amount of each account for any month or combination of months, and any extraordinary expense will at once attract attention.

For exhibiting the business to the directors the auditor makes a monthly report. This is a six page form, each page

being 8½ in. wide by 14 in. long, but only the four inside pages are used for the accounts. Two pages show summaries of the earnings and operating expenses under appropriate headings, and opposite each of the items are entered four amounts: 1. For the current month. 2. For the same month of the previous year. 3. For the number of months of the fiscal year which have expired. 4. For the same months of the previous year.

The other two pages show a condensed balance sheet having opposite each item three amounts: 1. To October 1. 2. For — months. 3. Total.

For the operating department, which comprises nine separate divisions, the car earnings per mile run are abstracted twice a month, giving those in charge of the department a thorough knowledge of what each line is doing and whether the facilities are sufficient. This abstract for each division is made on a sheet 16 in. by 21 in. folded down the middle, and gives the round trips, miles run, receipts, and average receipts per mile, and per passenger for each route in the division.

These totals from the nine division abstracts are recapitulated on a separate sheet, which shows the earnings for the horse and electric lines by divisions, under the same headings as the single sheets.

For comparison with the previous year the division totals are arranged on a sheet 10½ in. by 16 in.

The pay rolls are compared week by week on a blank, which shows the number of men and the amount of the pay roll. The pay roll is itemized so as to separate the station and car service, maintenance of electrical equipment, and road department, of each division; the operation of the several power houses; emergency crews, shops, yardmen, watchmen, harness department, electric linemen, etc., and the general offices.

These forms suggest to us a simple form of diagram, which could be applied to the accounts and would show comparisons for any desired period in small compass and give two things one usually wishes to know, how the totals

## WEST END STREET RAILWAY.

### Schedule of Operating Expenses.

#### General Expenses.

##### SALARIES, OFFICE AND GENERAL EXPENSES

- No. 1 Salaries, President, Vice-President, and Clerks
- 2 " General Manager and Clerks
- 3 " Treasurer, Paymasters and Clerks.
- 4 " Receiver, Clerks and Collectors.
- 5 " Auditor and Clerks.
- 6 " Purchasing Agent and Clerks
- 7 " and Expenses, Storekeeper and Dept. Clerks
- 8 Supplies and Expenses, General Offices.
- 9 Telephone Repairs and Expenses.
- 10 Fare Registers
- 11 Stationery, Printing and Advertising
- 12 Subscriptions and Gratuities.
- 13 Miscellaneous Expenses.

#### LEGAL EXPENSES

- 14 Salaries and Expenses of Attorneys.
- 15 " Claim Agent and Clerks
- 16 Expenses Claim Department

#### INSPECTION.

- 17 Services of Inspectors.
- 18 Inspectors' Fares and Expenses.

#### INSURANCE

- 19 Fire Insurance Premiums
- 20 Railway Insurance Premiums.

#### RENTS.

- 21 Rent of Land and Buildings
- 22 Rent of Oilier Roads (Trackage only)

#### Maintenance of Track and Buildings.

##### MAINTENANCE OF TRACK

- 25 Superintendence, Engineering and General Expenses Road Department.
- 26 Labor, Repairing Track
- 27 " Paving Track
- 28 " of Trenches, Road Department.

- 29 Labor of Watchmen, Road Department.
- 30 Timber and Ties
- 31 Rails and Fastenings
- 32 Frags, Switches and Guard Rail
- 33 Paving Blocks
- 34 Sand, Gravel and Cement for Track Repairs.
- 35 Maintenance of Cars and Vehicles for Track Repairs.
- 36 " of other Track Tools and Equipments.
- 37 Use of Horses for Track Repair.
- 38 Miscellaneous Expenses of Track Repairs.

##### MAINTENANCE OF BUILDINGS, ETC

- 39 Repairs of Stables and Horse Car Houses
- 40 " of Electric Car Houses and Repair Shops.
- 41 " of Power Stations (Exclusive of Equipment)
- 42 " of Miscellaneous Buildings.
- 43 Maintenance of Trenches, (Including Water Pipes)
- 44 " of Miscellaneous Fences, Sewers, etc

#### Maintenance of Equipment.

##### MAINTENANCE OF CARS AND VEHICLES.

- 47 Superintendence and General Expenses of Car Shop.
- 48 Repairs of Horse Cars.
- 49 " of Box Electric Cars
- 50 " of Open Electric Cars
- 51 Miscellaneous Car Repairs (Including Signs)
- 52 Repairs of Trucks for Electric Cars
- 53 " of Frames, " "
- 54 Transfer of Electric Motors and Trucks for purposes other than Repairs.
- 55 Repairs of Snow Plows and other Snow Equipment
- 56 " of Cargages, Wagons and Vehicles.

##### MAINTENANCE OF SHOP EQUIPMENT

- 59 Repairs and Renewals of Machinery and Tools for Shops. (Exclusive of Power Stations)

##### MAINTENANCE OF HORSE AND HARNESS EQUIPMENT

- 60 Renewal and Depreciation of Horses.
- 61 Shoeing and Veterinary Expense
- 62 Repairs and Renewals of Harness, Blankets and Robes.

##### MAINTENANCE OF ELECTRIC EQUIPMENT

- No. 64 Maintenance of Steam Equipment of Power Stations
- 65 " of Electric Equipment of Power Stations
- 66 " of Feeder Conduct.
- 67 " of " " Cables
- 68 " of Overhead Feeder Lines.
- 69 " of Poles
- 70 " of Overhead Lines
- 71 " of Track Wiring
- 72 " of Motor Armatures.
- 73 " of " Gearing
- 74 " of Motors, Miscellaneous
- 75 " of Rheostats and Controlling Mechanism.
- 76 " of Trolleys.

#### Transportation Expenses.

##### SUPERINTENDENCE AND GENERAL EXPENSES OF TRANSPORTATION

- 80 Superintendent of Routes and Clerks
- 81 Division Superintendents and Clerks
- 82 Inspectors and Aids
- 83 Station Recorders and Register Inspectors
- 84 Station Receivers and Register Inspectors
- 85 Miscellaneous Transportation Expenses

#### INJURIES AND DAMAGES.

- 86 Damages to Persons by Horse Cars
- 87 " " by Electric Cars
- 88 " " Property by Horse Cars
- 89 " " by Electric Cars
- 90 " and Gratuities to Employes
- 91 Miscellaneous Damages.

#### ROAD EXPENSES.

- 92 Labor, Washing Holes and Flagging Cuts
- 93 " Track Cleaning and Switchmen
- 94 Sanding and Watering Track (Labor, Sand, Fuel, Bores, etc)
- 95 Oil for Trunk.

#### SNOW EXPENSES.

- 96 Labor, removing Ice and Snow
- 97 Tracing Ice and Snow (Hired Teams)
- 98 Salt for Tracks
- 99 Tools and Miscellaneous Snow Expense.

##### CAR HOUSE AND STABLE SERVICE

- 100 Stable Superintendence (Wages, Stable Foremen, and Stable Inspector)
- 101 Superintendence Electric Car Houses (Foremen and Clerks)
- 102 Horsies, Feeders and Harness Cleaners.
- 103 Floormen and Shifters
- 104 Teamsters and Expressmen.

##### PROVENDER AND BEDDING.

- 106 Hay, Grain and Miscellaneous Provender.
- 107 Bedding for Horses

##### STABLE AND CAR HOUSE SUPPLIES AND EXPENSE.

- 108 Fuel Lights and Electric Lamps for Car Houses and Stables
- 109 Furniture, Fixtures, and Tools, for Car Houses and Stables
- 110 Water for Car Houses and Stables.
- 111 Miscellaneous Supplies and Expenses of Car Houses and Stables.

##### CAR SERVICE AND EXPENSE

- 113 Conductors, Horse Cars
- 114 " Electric Cars.
- 115 Drivers, Horse Cars
- 116 " Motorcars.
- 117 Drivers, Tow Cars.
- 118 Electric Lamps, Lubricating Oil, Waste and Miscellaneous Car Expense

##### ELECTRIC MOTIVE POWER

- 120 Steam and Electric Superintendence and General Expense
- 121 Labor for Power Account
- 122 Fuel for Power Account
- 123 Oil for Power Account
- 124 Water for Power Account
- 125 Miscellaneous Supplies and Expenses for Power
- 126 Power Hired
- 127 Power Sold

##### USE OF HORSES

- 119 Fuel for Horses (Coal, Wood)

All questions in relation to charges for the above accounts must be referred to the Auditor for settlement.  
H. L. WILSON, Auditor,  
Boston, Oct. 1, 1895.

compare, and how the percentages of the total compare for several items.

For a record by months covering a period of several years a scale of 3 in. to the year is probably sufficiently large; this would allow  $\frac{1}{4}$  in. between the vertical lines, each of which would represent one month. For the vertical scale 10 lines to the inch would probably be suitable for most purposes. To facilitate counting each 12th vertical line and each 10th horizontal line would be made heavier than the others.

Fig. 5 will serve to illustrate the idea. Suppose that the expense to be analyzed falls naturally into six items. The ratios which these items bear to each other or to the total

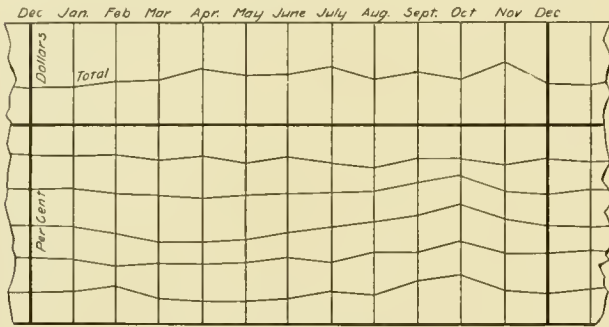


FIG. 5.

will in most cases vary from month to month, and a comparison of these ratios would show if any of the items have grown unduly, and direct attention to the special points which look as if further investigation might be desirable.

To effect this comparison readily lay off two heavy horizontal lines (10 in. apart with the scales we have assumed) so that there will be 100 small divisions between them. Then express the six items in percentages of the total and plot each of them, using the lower heavy line for the datum line for Item 1, this line for the datum line for Item 2, etc. This will result in a diagram similar to Fig. 5. The relative magnitude of each item is the height of its portion of the diagram. Any change in this relative magnitude shows in the convergence or divergence of the two bounding lines.

The total of the account would be plotted on the same sheet, making the vertical scale dollars instead of percentages.

To apply this to say, the "schedule of operating expenses," it would be convenient to have a book of these sheets. On the first sheet would be the grand total shown by a line the several points on which are entered from month to month and the relative proportions of the totals of the four grand divisions shown below it.

The next four sheets would show absolutely the totals for the grand division, and relatively the sub-heads under them.

Succeeding sheets would continue the sub-division, giving the sub-heads absolutely and the items relatively. This could be carried as far as it was found desirable or profitable to go.

The Helena (Mont.) Power & Light Company has leased property of the Montana Central Railway Company to be used for a base ball park.

A SIMPLE POSITIVE BLUE PRINT PROCESS.

In a letter to "Engineering News," John D. Isaacs, of the Southern Pacific Railway Company, San Francisco, describes a simple and practical process for making positive blue prints, that is, prints having blue lines upon a white ground, which is used in the draughting rooms of that company. Such prints are very desirable where plotting or coloring is to be added.

The process is thus described: The tracings are made with strong black lines using Higgins' "American White Label" India ink. A paper negative is first made on ordinary photographic silver printing out paper, such as Solio, or Kloro paper. The paper used is the "Victor Special" brand, which can be had in rolls 25 in. by 30 ft., and is not expensive. To make the negative, cut the paper one-half inch larger each way than the tracing; place the tracing in an ordinary blue-printing frame, face up—that is, with the side drawn upon away from the glass; on this place the paper face down, so that the inked lines and the sensitized surface are in contact; then print in the sun to a dark coffee color. The print is soaked in water until drippings from it are no longer milky. It is then placed in a fixing bath made up about as follows (exactness is not important): Hypo-sulphite of soda, 1 ounce; water, 25 ounces.

The print will change in this bath to a uniformly light mahogany color or dark buff. After becoming uniform in tint, it is left in the bath five or ten minutes longer. It is then removed and washed for half an hour; then allowed to dry thoroughly, after which it will be much darker. When thoroughly dry the back of the negative should be given three good coats of the following varnish: Canada balsam, 1 part by volume; spirits of turpentine, 3 parts by volume; alcohol, 2 parts by volume. Apply quickly with a sponge. Let each coat dry before applying another. Work in a warm room.

The result is a fairly transparent negative (reading backwards) of a non-actinic color, with clean white lines and figures, from which the positive blue prints are made on ordinary blue-print paper. Printing takes about twice as long as in the case of those ordinarily made, from a tracing, but several negatives can be made from one tracing if many prints are required. When through printing we file the negatives with the tracings, for future use.

The best method of getting the time of exposure for making the negative is to try one or two scraps of the paper first under the tracing and note the time giving the best negative; after which, uniform results can be had without difficulty. At this season of the year (May) the printing requires three and a half minutes in the sun in the middle of the day, under a clean tracing. If here and there a line or figure in the negative is indistinct from bad contact in the printing frame, it may be easily "doctored" by scratching with a pin-point or other sharp point through the gelatine surface of the paper after the negative is otherwise finished. A fresh fixing bath should be used for each batch of negatives made. Before making the positive blue prints, test a small scrap of the blue print paper by washing before exposure to the light. It should wash clean, leaving no bluish cast to the paper. Soaking and washing the paper negatives, as above, may be done in the blue-print washing tray in which blue prints are being washed, as the two processes do not affect each other.



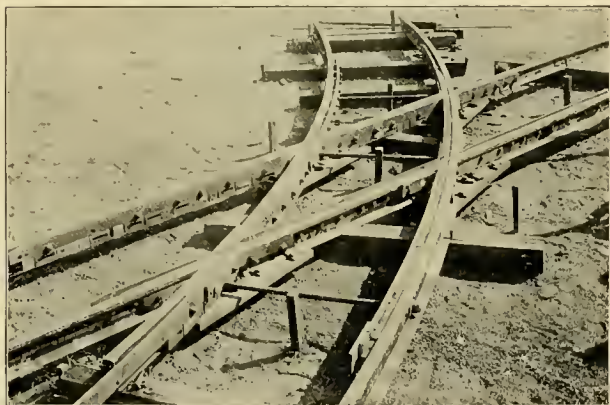
## NOTES FROM DENVER.

A new park has been opened in Denver, called Chutes Park, by a company closely allied to the Denver Consolidated Tramway Company, and it is the intention to make it one of the finest pleasure resorts in the west. At present there are two chutes, two roller coasters, amphitheater, race track and bicycle track; a large lake is an additional attraction. There are also numerous fruit stands, candy booths, etc. A theater, restaurant and zoo are soon to be added. "Shooting the chutes" is new in Denver and at first the people were afraid to venture the trip; now, however, they can't be held back.

Prior to opening this park the street railway route on which it is located could never be made to pay operating expenses, but the park business has made it a paying line. On Sundays, holidays and pleasant evenings the traffic has been so heavy that it was necessary to run cars on a headway of one and one-half minutes. The Tramway Company has advertised the park extensively and is now reaping its reward.

The Tramway Company has relaid all of its 15th street line, both Upper and Lower 15th streets, and is now engaged in relaying the Colfax avenue line with 60-ft., 75-lb. rails. Colfax avenue was formerly a cable line, and when electric traction was adopted it was soon found that the track was too light for the heavier cars.

The illustration is from a photograph of a curve in the loop at 15th and Arapahoe streets, taken when the work



SPECIAL WORK, DENVER.

was put together for inspection. This loop was described in the REVIEW for February last. The 15th street, Colfax avenue and Broadway track is of the same construction, and it will be used in all new work.

The accompanying picture shows "Tramway Billy," who is the company's pet. He is 10 years old and one of the smartest dogs that ever was; he has been with the company ever since the first cable was started on Broadway, and now lives near the South Denver loop, the terminus of the Broadway short line.

Originally there were four cable lines; Broadway cars were painted orange; Colfax avenue, white; 18th avenue, blue, and 22nd avenue, green. In the old days "Billy" would take regular trips over the various lines, visiting the

different barns; he changed cars at the points he found most convenient and never failed to get the car he wanted, knowing it by the color. On the grip cars there were short seats running lengthwise at the front end beside the gripman, and "Billy" usually occupied a seat there when aboard. Of course all the officers and men knew "Billy."

When waiting for a car he always stands on the right



"TRAMWAY BILLY," OF DENVER.

corner, like any other passenger, and makes it a point not to become mixed up in street fights. Now he is getting old and the cars bother him to some extent, as there are 24 lines and the cars are all of one color. The four old lines never trouble him, as he remembers them, but the cars on the other 20 lines disconcert him. Whenever a motorman or conductor sees "Billy" waiting in the street he calls the line and "Billy" waits till he hears the line he wants. Recently the writer was standing at the loop, watching "Billy" waiting for a car; several passed but he made no move until a motorman called "40th street, Billy," when he wagged his tail and climbed aboard.

He wears a nickel-plated collar with the name "I am your Bill" and is known to half the people of Denver.

## AN ELECTRIC RAILWAY IN ALGIERS.

Some of the colonies of the European powers possess a more progressive spirit in railway affairs than the mother country, this being especially true of England and street railway extensions are much hampered in the French cities. The first electric railway in Algiers has been built by the French Thomson-Houston Company and is 4.7 miles in length. There are 18 motor cars in service each equipped with two G. E. motors specially designed to suit the 3 ft. 5½ in. gage. A partition divides the car into two compartments for two classes of service. There is seating capacity for 20 passengers and standing room for 20 more. The power station contains Corliss engines belted to three 200-k. w. dynamos. The system is operated at a voltage of 500 to 550.

The La Fayette (Ind.) Street Railway Company has just placed on its Soldiers' Home and Tecumseh Trail line two 10-bench open cars made by the Brill Company.

## STORAGE BATTERIES.

The history of storage batteries down to a recent date has been an almost unbroken record of failures. The progress has been slow compared with the advancement made in the facilities for generating, transmitting and applying electricity. The storage battery has been known for 40 years and its utility has long been recognized. It has been applied in many ways but in service has invariably developed inherent defects. Nevertheless this branch of the science has been given careful attention by many able electricians and their efforts are now beginning to show in a practical way.

Although storage batteries is the name in common usage in this country they are also known as accumulators or secondary cells. The latter name was first applied to make a distinction from the primary cells. In speaking of the electric storage battery it is not intended to convey the idea that the electricity is actually stored, but rather by the passage of an electric current chemical changes result in the plates and this reaction can be reversed, discharging an electric current. As far as the chemical properties, the connections and the current and electromotive force per unit area of plates are concerned the storage batteries are similar to primary batteries, but the great point of advantage is that after discharge the materials are brought back almost to their original state.

The parts of a cell consist of the positive and negative plates, the electrolyte or fluid and a containing jar or box. The electrolyte is generally a dilute solution of sulphuric acid, and lead has been found the only suitable metal for the plates. The positive plate consists of a lead support called a grid or frame on the surface of which is a coating of peroxide of lead, and the negative plate is of pure lead in spongy form. The lead peroxide at the positive electrode and the lead at the negative electrode form the so-called active material and undergo the chemical changes. The grids not only serve as a backing to the active material, but also act as conductors of the current. The lead plates are connected in parallel in two sets, one positive and the other negative, the positive and negative plates alternating. The general arrangement of the parts of a cell may be noted in Fig. 1.

The lead and sulphuric acid batteries are divided into two classes: those with plates of the pasted or Faure type and those of the electrolytic or Planté type, both of which are largely represented in commercial work and will be described later. There are the lead-copper cells with the positive plates coated with lead oxide and the copper negative electrodes immersed in a solution of copper sulphate. Another kind has the same positive plate, but with a negative zinc electrode and a sulphate of zinc electrolyte. The alkaline cell has a positive plate of porous copper, negative plate of iron gauze and the battery liquid is sodium or potassium zincate. These batteries each have their strong points and have been employed in practical work more or less in Europe, but in this country the lead-sulphuric acid cell is the only one in common use.

In the lead batteries the positive plate is the source of weakness and has been the center of attention of inventors. As a rule these are one of three general forms. The active material is held in undivided masses supported by a surrounding grid, the active material being first molded to the desired form and the grid afterwards cast about it. The second class includes those plates whose surface is covered with a thin

layer of active material deposited by electrolysis. The third class consists of those plates in which the active material is thinly spread over the surface of a number of independent metal pieces which are held together by a supporting frame.

The efficiency of a storage battery depends very largely upon the rates of charge and discharge and in most cases is about inversely as the time. The losses in the cells are due to the formation of chemical compounds in charging that return no energy in discharging; some energy is dissipated in heat, and in producing oxygen, hydrogen, ozone and hydrogen peroxide. There are also losses from local action in the active material and between the grids and the active material. Under the most favorable conditions these losses amount to 10 per cent and greatly increase with rapid discharge rates. At the Edison station in New York an average

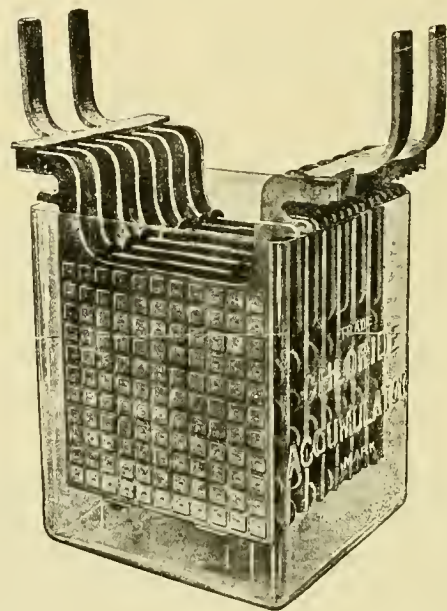


FIG. 1.

daily efficiency of 85 per cent is attained, and in a battery plant in Hanover, Germany, the efficiency is 78.4 per cent. These are lighting stations and not subject to the sudden and extreme fluctuations of a street railway station.

When electric traction was being introduced it was claimed that the storage battery would prove the solution of the problem. In theory it did present many ideal conditions. It provided a self-contained motor car with no outside accessories as trolley lines, feeders and bonds for the transmission of the current. The electric current could be generated in a station free from overloads and troublesome peaks at certain times of the day, and thus the station need only be of minimum capacity for the work required. Ingenious apparatus was devised for removing and replacing the batteries in the cars. As early as 1880 experiments along this line were made in London and their partial success encouraged further tests in Paris, Brussels, Birmingham and Hamburg. Similar work was also carried on in New York, New Orleans, Washington and Dubuque, but the short life of the batteries and the enormous expense of renewing the positive plates resulted in failure. So long as the storage battery car received the direct attention of experts in that line they were moderately successful, but the batteries quickly deteriorated under the care of the ordinary railway employes.





lbs. loaded. With the battery on this car it makes 10 round trips a day, covering 96 miles. The average speed is 9.3 miles an hour, but 14.25 miles per hour is the best performance. During one month the car made a mileage of 2,883. The average consumption of energy was 27.6 watt-hours per ton-mile, or nearly three-quarters of a horse power per car-mile.

In connection with tests of storage batteries on cars and elsewhere the General Electric Company has recently introduced an instrument, Fig. 4, for this purpose, which will greatly facilitate the collection of accurate data. It is a recording storage battery meter, which is simply an adaptation of the Thomson wattmeter to such service, the mechanism being very similar. The meter is provided with a single indicating dial needle moving over a horizontal semi-circular dial, which shows at a glance the amount of energy available in the battery. The accuracy and durability of the instrument have been maintained from its prototype with

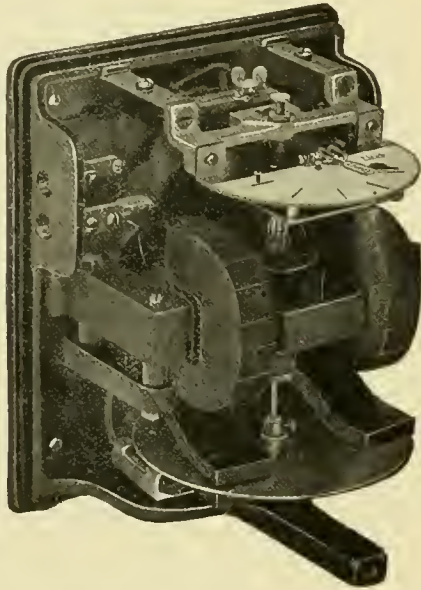


FIG. 4.

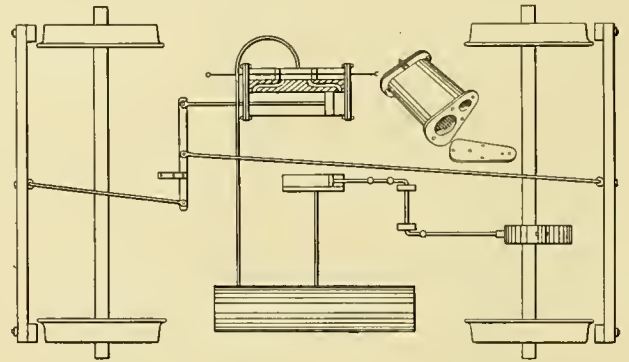
additional precaution against injury from shock and vibration.

The armature will rotate in either direction and give accurate readings, thus the instrument indicates the amount of energy which passes into the battery while being charged and the energy withdrawn is subtracted. To compensate for the loss in the battery the meter runs slow in charging and indicates the amount of energy available so that when the battery is discharged the needle points to zero. Such an instrument would be of value attached to any kind of conveyance with storage batteries, for the operators can tell at any time the energy in the batteries and the proper time for re-charging can be ascertained with accuracy. These instruments are made for any size to order; the standard size reads for a current of 50 amperes.

Although it is certain that the application of storage batteries to street cars and vehicles will not meet with failure as in the past, yet they still remain bulky and heavy for such work. Their great field of usefulness now seems to be in the power station as an auxiliary to the generating machinery, and this phase of the question will be discussed in a succeeding number.

## GRAY AIR BRAKE.

C. A. Gray has patented an air brake for street cars which is shown in the accompanying sketch, together with arrangement of the compressor which is driven by an eccentric from the axle. The brake cylinder and valve chest are shown in section and their operation will be readily understood. When in the position shown, air from the reservoir



GRAY AIR BRAKE.

is admitted to both ends of the brake cylinder; to apply the brakes the valve (which is connected to levers at both ends of the car) is thrown to the right and opens the left hand end of the brake cylinder to the atmosphere, when the unbalanced pressure in the other end throws the piston. The release is effected by throwing the valve over and exhausting the other end of the brake cylinder. Of course the application is gradual or sudden according to the quantity of air that is permitted to escape.

## NEW MEMBERS OF THE ACCOUNTANTS' ASSOCIATION.

W. B. Brockway, secretary of the Street Railway Accountants' Association of America, advises us that since the list of new members was published in the REVIEW for February, the following companies have joined the Association:

The Market Street Railway Company, San Francisco.

The Oakland Transit Company, Oakland, Cal.

The Compania Ferrocarriles, Mexico, Mex.

The Haverhill & Amesbury Street Railway Company, Haverhill, Mass.

These are all important companies and the fact that they have become members of the Association is a gratifying indication that its work is appreciated, and gives further assurance of its continued growth and prosperity, and brings the membership up to nearly seventy.

## EUROPEAN INTERNATIONAL TRAMWAY CONVENTION.

The secretary of the Permanent International Union of Tramways, F. Nonnenberg, advises us that the next meeting of the Union will be held at Geneva on August 25, 26 and 27. The list of the topics which will be discussed was sent to members over a year ago and a translation was published in the REVIEW for May, 1897. Among the excursions which have been arranged for the delegates is a trip on the lake, including a visit to the Tramway de Montreux and ascension of Glion by the cable railway; another excursion is the ascent of Mt. Salève, near Geneva.



**STANDARD GEARED AIR BRAKE.**

The accompanying illustrations show the improved axle-driven air brake for street cars upon which the Standard Air Brake Company has been working for some time past. It is specially designed to meet the requirements of high speed interurban service, one of which is that for durability the compressor must be used only when it is needed; the capacity of the pump is ample to supply air for all the many stops when the car is in city service.

In fitting a car it is preferable to place the pump, reservoir and brake cylinder as close together as possible and thus reduce the pipe required to a minimum. Installations have been made with only 7 ft. of pipe under pressure, exclusive of the gage pipe.

The driving mechanism consists of a split gear fastened

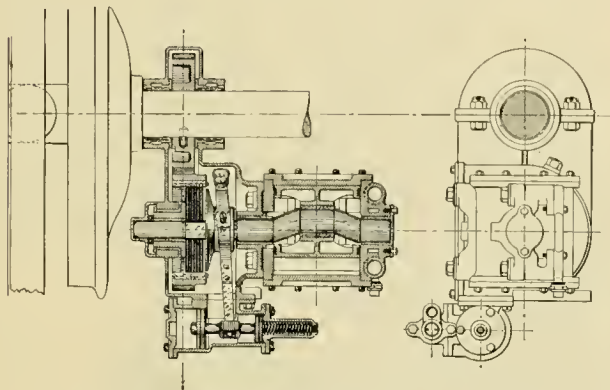


FIG. 1.—SECTION AND SIDE ELEVATION OF PUMP.

to the car axle and meshing with another gear running free on the pump shaft and forming one member of a friction clutch. The friction clutch comprises a number of plates, half of them free on the pump shaft and half of them fixed to it; when pressure is applied the plates are forced together and the pump shaft is rotated, but without starting shock. The necessary pressure is applied by the governor through a shipper, yoke and collar on the shaft.

The case is dust proof and contains all the driving parts except the pump and governor, which are bolted rigidly to it. Inside the pump and case is about one gallon of oil, which gives thorough lubrication of the working parts.

The pump is double acting, having a piston cast hollow and in one piece, within which are the crank, crank brass and ways. The bearings, subject to the thrust of the piston, are inside and quite beyond the reach of dust. The suction and discharge valves are in the cylinder body and are provided with movable seats to facilitate repairs. The suction and discharge ports are cored to one inlet and one outlet respectively, and the heads of the pump are not encumbered with any valves or piping. This construction renders the pump easy of access, and no pipe connections have to be disturbed in examining or cleaning. Under the suction valves are means for lifting them by exhaust air just before the operating mechanism throws the clutch into engagement, thus relieving the latter at that instant of any load.

The governor consists of two cylinders of different diameter, in one casting, fitted with two pistons correspondingly, which constitute the operator, the larger portion and cylinder being twice the area of the smaller. The two pistons

are also one casting, and in the center is attached a shipping lever for operating the clutch. Above, and bolted to the larger cylinder, is the valve chamber of the governor proper, which controls the air to the large cylinder of the operator. Within the valve chamber is a brass slide valve attached to a hollow valve stem, one end of which is a piston against which the air pressure in the chamber acts in overcoming the pressure of the spring within the hollow valve stem.

The air pressure is always in the smaller cylinder, which holds the clutch in contact, and is also at all times in valve chamber, acting on piston against the spring. When the air pressure reaches a predetermined maximum pressure, it overcomes the resistance of the spring and moves the hollow valve stem, which draws with it the slide valve, opening a port which permits the air from the valve chamber to enter the larger cylinder, which, being twice the area of the

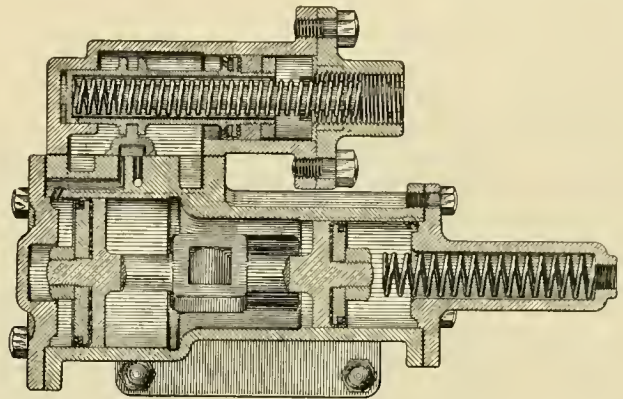


FIG. 2.—GOVERNOR.

smaller one, forces the shipping lever in the opposite direction, consequently disengaging the friction clutch, and the pump remains at rest. When the air pressure drops to a predetermined minimum pressure, the air in the valve chamber of the governor has not pressure enough on the piston on the hollow valve stem to resist the force of the spring, consequently moves back in the opposite direction, drawing the slide valve with it until it opens the port from the larger cylinder to the exhaust. The air pressure which held the

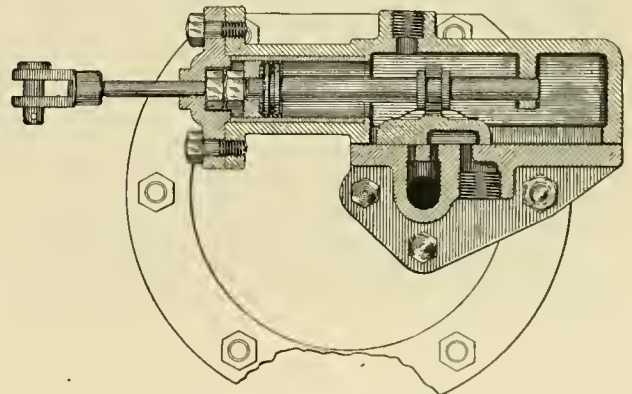


FIG. 3.—OPERATING VALVE.

clutch out of engagement is released, and, since the air pressure is always on the smaller cylinder, this throws the clutch into engagement again, through the shipper lever, and the pump recharges the reservoir to maximum pressure.

The reservoir is of the cold weld type and absolutely air tight. The brake cylinder is the ordinary hollow spindle type, attached to the floating lever.

The operating valve is bolted to the brake cylinder head, obviating pipe connections, and all danger of leaks, which were a common source of trouble when operating valves were placed one on each platform with a double line of pipe the entire length of the car. The valve has a cast iron body, in which is the brass valve operated by means of a steel spindle. The reservoir pressure is in this chamber at all times and holds the slide valve in the "off" position.

There are three ports under the slide valve, a small port for service stops; a large port for emergency application of the brakes, and an exhaust port. The lap of the slide valve is long enough to cover both the service and emergency ports at the same time. The exhaust passes from the emergency port under the hollow slide valve to the exhaust port and is carried by piping to the chamber of the governor spring and also under the suction valves in the

arc of 180° and the movement is conveyed to the operating valves by means of a rod, chains and bell crank lever under the floor of the car. By a movement of 90° the service port is opened; 170° gives the emergency stop. The instant the handle is released the air pressure on the piston in the operating valve opens the exhaust port. The handle is removed upon changing ends and the staff remains locked in the release position. By putting the handle in emergency position and withdrawing it as far as possible the brake can be left applied.

### ELECTRICITY FOR SWITCHING.

Electric locomotives for switching and yard hauling have been put in service at the Arlington Mills, Lawrence, Mass., superseding the steam locomotive formerly in use.

The electrical installation consists of a small generating plant and two electric locomotives, one of the box type and the other a platform car. The generating plant consists of



ELECTRIC SWITCHING, ARLINGTON MILLS.

pump; and from there it passes by the suction valve "lifts," and out to the atmosphere through the inlet for the suction. The exhaust from the brake cylinder, therefore, performs two functions. It lifts the suction valves of the pump so that there is no load when the friction clutch makes its contact, and also, in going to the chamber of the governor spring, acts with the latter, and, partially equalizing the air pressure on both sides of the piston, the spring forces the hollow valve stem over and with it the brass slide valve, so that the air in the large cylinder of the governor exhausts, and the clutch is thrown into engagement, and the pump restores to the reservoir the air that was used in making the previous stop, the car having run about 40 ft.

A feature of this apparatus is the short periods for which the compressor is in operation. In Jersey City and Brooklyn it is running less than one-fourth the time, and between Jersey City and Newark, where there is a long stretch with few stops, the compressor is in operation for not over 400 ft. in 25,000 ft.

The platform equipments consists of a 3/4-in. cold rolled iron staff within a piece of 1-in. iron pipe supported by the dash-rail. On top is a pressure gage, and immediately under it is the handle. This handle moves altogether through an

a standard G. E. 75-k. w. 500-volt railway generator belt driven by an Armington & Sims high speed engine.

The box car locomotive used for hauling material about the yards is equipped with two G. E. 800, 27-h. p. motors and series parallel controllers. The platform locomotive is used to haul trains of loaded cars from the yards to the main line, and empties from the line to the mill tracks, and to do all the drilling in the yards. The equipment of this locomotive consists of two 50-h. p. G. E. 1,200 motors with the necessary series parallel controllers. In hauling heavy trains it is assisted by the box car locomotive. Together they are able to handle trains of 30 to 40 empties, or 12 to 14 loaded cars, with comparative ease and celerity. To give the necessary adhesion to the more powerful locomotive to enable it to handle heavy loads six tons extra weight is placed on the platform.

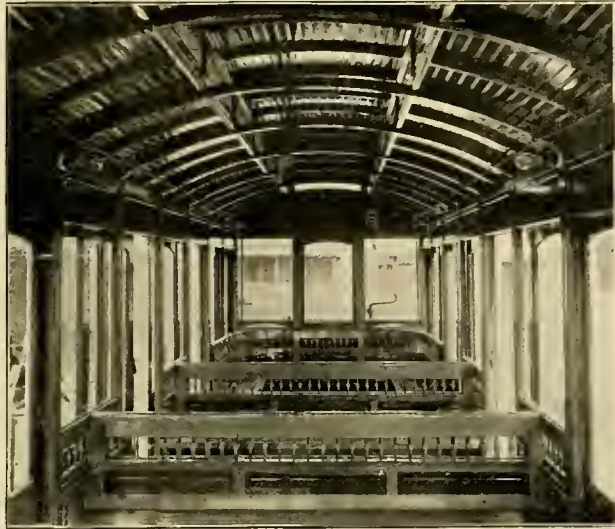
The entire cost of the electric plant is stated to be but little in excess of the yearly rental heretofore paid for the steam locomotive.

Fredonia, N. Y., has had a siege of smallpox, and during a short time trolley connections between that village and Dunkirk were discontinued.



**A FLORIDA COMBINATION CAR.**

The question of keeping a summer and winter equipment of cars is not the same in the southern cities as it is in the north. Open cars are suitable and desirable for service for the greater part of the year, but during the rainy season,



INTERIOR OF CAR.

when a storm unexpectedly blows up, the rain comes down in torrents. The open cars with curtains afford inadequate protection from the weather under such conditions. Geo. D. Musing, general manager of the Consumers' Electric Light & Street Railway Company, of Tampa, Fla., has designed and built several cars to fulfill the requirements.

ends of the car. There are three doors on each side and side steps are provided. A special hanger has been designed for the storm doors which enables them to be moved noiselessly and without difficulty, and the doors will stay wherever placed. The cars are mounted on Brill trucks and equipped with General Electric motors.

The cars were built at Ybor City and are constructed entirely of Florida woods. The frame is of heart pine, and the interior is handsomely finished in native ash and cypress. When the troops concentrated at Tampa these cars were put to a severe test. As many as 150 passengers were carried at one time on one of these 26-ft. cars. The operation of the cars has been so satisfactory in every particular that Mr. Musing has received several inquiries from different parts of the country, with the result that cars will be built for a number of roads in southern cities.

**CONVICTED OF PERJURY.**

In the REVIEW for April, page 270, were given the details of a conspiracy against the Chicago City Railway which had for its object the prosecution of a personal injury suit against the company. The plaintiff, Mrs. Jennie Reynolds, and one of her witnesses, Milton H. Fountain, were indicted for perjury. Mrs. Reynolds forfeited her bonds and is now in Canada. Fountain was convicted June 16 and sentenced to the penitentiary.

**NEW LINE AT BIRMINGHAM, ALA.**

Early in June the Birmingham (Ala.) Railway & Electric Company began running its cars to Powderly, superseding the steam dummy service. On the occasion of the official



COMBINATION OPEN AND CLOSED CAR, TAMPA, FLA.

They are already in service, and now that the rainy season has set in they have had a practical test and have proved in every way superior to the ordinary open cars. When all the end windows and the doors are open the car is cool and airy, but these can be quickly shut, making it practically a closed car.

The car contains eight seats so arranged to afford accommodation for 40 passengers, two of these seats being at the

opening two special cars containing the officers of the company and over 100 invited guests were taken over the line. Refreshments were served and on their return the party was photographed. Resolutions of thanks to the company and to J. B. McClary, the general manager, for the part taken in developing the street railway system, and of congratulation upon the successful completion of this line were unanimously adopted.

# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

The reason why it pays to heat the feed water by live steam taken directly from the boiler has lately been the subject of discussion in England. That there is an economy in using live steam heaters has been shown experimentally and generally admitted, though the reason why taking a given number of thermal units from the boiler in the steam and restoring a necessarily smaller number of thermal units in the feed should result in an economy of 10 or 20 per cent was far from evident. Mr. Kilkardy found a gain of 10 per cent from the use of his heater, and in the 10 years since that time the use of live steam heaters has enormously increased.

At the 36th meeting of the Institute of Naval Architects (English), M. Normand presented a paper in which was shown an economy of 20 per cent by a method of heating the feed devised by him. He took the steam from the low-pressure cylinder of a compound engine about mid-stroke, and attributes the gain to two causes: 1. The use of steam which has already done work, which saving may amount to from 10 to 14 per cent. 2. The circulation in the boiler is improved and the passage of the water over the plates more rapid. It is the second gain which is due to the hotter feed such as we have with live steam heaters. In discussing this paper McFarland Gray, as reported by "The Engineer," said: "The reason why the Belleville economizer was so efficient was that the boilers proper had nothing to do but to make steam. As much as two hundred years ago Captain Savary had patented an invention which went to the root of the whole matter. He used two boilers; he heated his feed water to boiling point in one, and made his steam in the other. Some little time ago Drutt Halpin was surprised to find that an economy of 16 per cent was realized by the use of one of his heaters at an electric light station. Steam, when the load was light, was blown into a great tank of water under pressure, and the heat was stored and utilized subsequently when the load was heavy. There was no apparent theoretical reason why an economy of fuel should be effected, but, as he said, 16 per cent was obtained. Lest there should be a mistake, Professor Unwin was called in and made a trial at Margate, and found a saving of 19 per cent. There was actually a great economy effected by taking live steam out of a boiler to heat the feed, and for some time this was inexplicable. At last he found the solution, which was that when water at the boiling temperature was brought into contact with heating surface it was much more efficient in taking up heat than was cold water. At Margate they found that the chimney temperature was reduced by very hot feed, other things being the same. There should be no heat given to the water in the boiler but latent heat. Much the same thing had, he believed, been said by Professor Elliott some years ago."

In an editorial commenting on this, "Power" points out

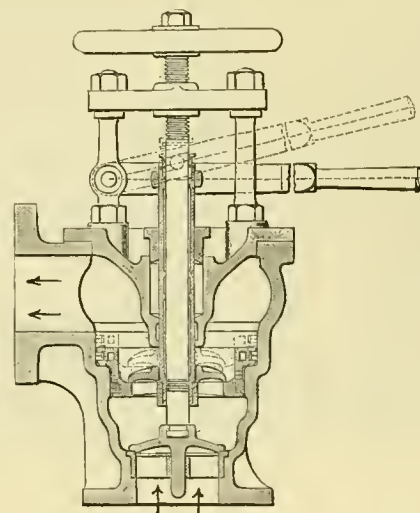
that such substances as ether, which boils at or below the temperature of the body or of the surrounding atmosphere, produce in evaporating the sense and effect of cold by withdrawing heat from the surrounding bodies. When the water in a boiler is already at the temperature due the steam pressure it is in a state similar to ether when held in the hand, and capable of absorbing heat much more rapidly than if its temperature were only raised, and it is said: "The effect appears then to be due to an improvement in the efficiency of the heating surface by the use against it of a fluid capable of absorbing heat at a more rapid rate than does water below the boiling point, in much the same way that an improvement in efficiency by the use of enforced circulation is due to the more rapid carrying away of heat from the plates by the circulating water."

\* \* \*

## Double-Acting Automatic Stop Valve.

The accompanying illustration shows a stop valve for steam boilers which will close automatically whenever the boiler pressure falls below that in the steam main, and also when the pressure in the main falls considerably below that in the boiler. The valve is made by a Glasgow firm, McFarland & Co., and was described in "The Engineer," of London, from which we take the illustration.

These valves are fitted and worked like the ordinary stop valves now in use. There is on the outlet branch an ordinary screw-down valve operated by the hand-wheel. Above this, and mounted on an outer spindle, or sleeve, is a loose, movable piston, having two surfaces, an upper and lower, on which the pressure of the steam acts. This piston, which is an easy fit in the chest, is provided, as shown, with Ramsbottom rings.



In the bottom of the piston valve ports are formed, and on the inner ledge of the bottom of the piston sits a loose disk valve, which forms a steam-tight face over the ports in the piston. The outer sleeve or spindle is attached to a testing lever, so that by working the lever the piston is moved, and its good working conditions insured.



COST OF POWER FOR ELECTRIC RAILWAYS.  
Output Measured by Wattmeter in Each Case.

STATION.	MONTH.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel. per k. w. h.	Price of Fuel per Ton of 2,000 Lbs.	Kind of Fuel
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.	Total.						
1.....	Apr.	1,276,618	.308	.174	.033	.030	.037	.582	4.2	.8	9.3	2.92	\$2.10	Bituminous.
3.....	"	238,259	.421	.249	.049	.009	.012	.740	5.3	3.7	.....	3.06	2.17	"
4.....	"	308,125	.357	.203	.029	.003	.023	.615	3.4	3.0	.....	3.31	2.16	"
5. Metropolitan Elevated, Chicago.	"	1,469,156	.326	.155	.018	.027	.053	.579	5.8	1.5	.....	3.76	1.82	"
6.....	Mar.	521,300	.764	.237	.122	.....	.093	1.216	.....	.....	.....	2.69	*	Oil.
6.....	Apr.	502,220	.778	.257	.099	.....	.152	1.286	.....	.....	.....	2.78	**	"

\* 89.32 cents per barrel.  
\*\* 88.03 " " "

When the stop valve is opened the steam passes through the ports in the piston valve and lifts the non-return valve up against the end of the stuffing-box, holding it in that position, and at the same time exerting its pressure on the upper and lower surfaces of the piston valve when passing to the engine. In the event of a rupture to the surface pipe, and an outburst of steam, the pressure in the pipe and on the upper surface of the piston valve is released. The valve is instantly moved up against the non-return valve in its raised position, and the supply is shut off. The engraving shows the automatic piston valve in the open position, and the dotted lines in the closed position. While the steam is flowing to the engines the loose non-return valve mounted on the outer spindle is, of course, held up against the end of the stuffing-box. Should the pressure in any of the boilers be reduced, due to a burst tube or an explosion, the direction of the flow of steam is reversed, and the steam in seeking to pass from the other boilers into that which is damaged, acts on the back of the non-return valve and shuts it on its seat on the piston valve, thus isolating the damaged boilers from the remainder. The arrangement therefore acts both for a ruptured pipe and a damaged boiler, the automatic piston valve being moved up against the non-return valve and shutting off the supply when the pipe is ruptured, and the non-return valve is shut on its seat on the piston valve when any one boiler in a group is damaged.

\* \* \*

### The Hanging and Setting of the Horizontal Fire-Tube Boiler.

Orosco C. Woolson, of New York, presented a paper at the last meeting of the American Society of Mechanical Engineers which had the foregoing for its subject, and as a subtitle, "A Philippic on the Common Method, and a Method of Remedy." The "Philippic" is very interesting but we must content ourselves with a brief abstract of the points made against the common methods. Any four-point suspension is condemned because it may become a three-point suspension and the fact not be discovered except by accident. Side brackets and rollers are seldom properly placed, and the rollers are prone to become twisted and introduce the friction they were designed to avoid. If side brackets are to be used the bearing surfaces should be planed, and when put in place doped with a mixture of tallow and black lead. It is wrong to build the brickwork close about the boiler and thus prevent any motion unless

the setting be carried along. Buck stays as commonly used have no function except to crack the brickwork.

The second portion of the paper is given in full below :

Figs. 1 and 2 show a method of hanging and setting a horizontal fire-tube boiler which I believe to be superior in every particular.

First.—Hang the boiler at three points only. The rear point is to sustain two-thirds of the total weight of the boiler, and becomes the swinging point.

Second.—This rear point is to sustain its load entirely clear of the brickwork, upon cross channels which rest, at their extremities, on steel uprights.

In the center of this crossbeam there is located a cast iron saddle in which the swinging-pin rests, and from this pin a steel strap is suspended, which spans at its lower end a heavy steel equalizing bar to which it is connected by steel pins also. At the extremities of the bar there are pinned steel links, to which the weight of the rear portion of the boiler is hung. It is obvious, therefore, that there is no influence exerted by this arrangement, except to swing the boiler, leaving it perfectly free to go and come, as influenced by expansion and contraction. By the interposing of this equalizing bar we avoid any possibility of bringing strains or distortions into the shell of our boiler, or side thrusts into our brickwork, if for any reason the loaded foundations or side walls should settle, and there is less likelihood of getting the boiler out of its exact position when removing the blocking, and we are also enabled to raise or depress the rear end of the boiler to accommodate piping, blow-off, etc., with ease and accuracy by removing or adding the necessary shims under the center saddle, and when finished it is not susceptible of being tampered with. No planing or tooling of any kind other than the drilling of pinholes is necessary for this construction.

Third.—The two forward supports each carry one-sixth of the total weight of the boiler, and consist of steel ears reaching out from the shell and resting upon long cast iron shoes set out flush with the outside walls, thus bringing this weight of the boiler upon the red brick walls and entirely off the firebrick lining of the furnace. These ears are masoned solid into the brickwork, thus fixing the boiler against any fore and aft movement at this point. The shoes are made the depth of a brick and three bricks in length, providing thereby a very liberal distribution of its load. In setting these shoes it is simply necessary to bring one side flush with the outside wall, and wedge and point it up

snug under the steel ear, the ordinary mason work being sufficiently level for these plates. All the rest will take care of itself. Where two or more boilers set in one battery, the aforesaid ears lap by one another on the same sole plate and are bolted together to afford a maximum resistance for the furnace buck stay anchorage. These ears are riveted or bolted in between heavy steel angle irons, which are riveted to the shell, when the boiler is erected, but are shipped separate from the shell.

Fourth.—The set of buck stays shown alongside of the furnace wall are anchored at the bottom in the usual manner, but at the top their anchor bolts hook on to the ears of the shell, thus avoiding a long rod over the top of the shell (long rods not yielding to the "breathing" of the boiler when heated up and cooled down), and always preserving a tight hold of the brickwork, keeping it snug up to the boiler under all conditions of expansion and contraction of

on Fig. 3 at A and A'. Over the short leg of this beam laps one leg of an angle iron which is riveted to the rear head of the boiler. This angle iron is cut just the length required between the side walls of the combustion chamber; the vertical leg near the extreme ends is cut to a pattern, and these ends turned down flat with the horizontal leg; this turned down portion fits round the curve of the boiler head, thus altogether forming a tight joint. The long leg of the cast iron beam forms a buttress over against which the back arch is sprung, thus forming an arch not only laid in the proper direction, but provides liberal head room on the sides as well as in the middle of the boiler. The first engineer to use this style of arch beam was, I think, I. V. Holmes, but it is improved by having a series of depressions on the long face as shown. With these depressions the brick arch gets a better anchorage, not only to stand its own weight and the sand filling above, but the occasional weight of the workman who

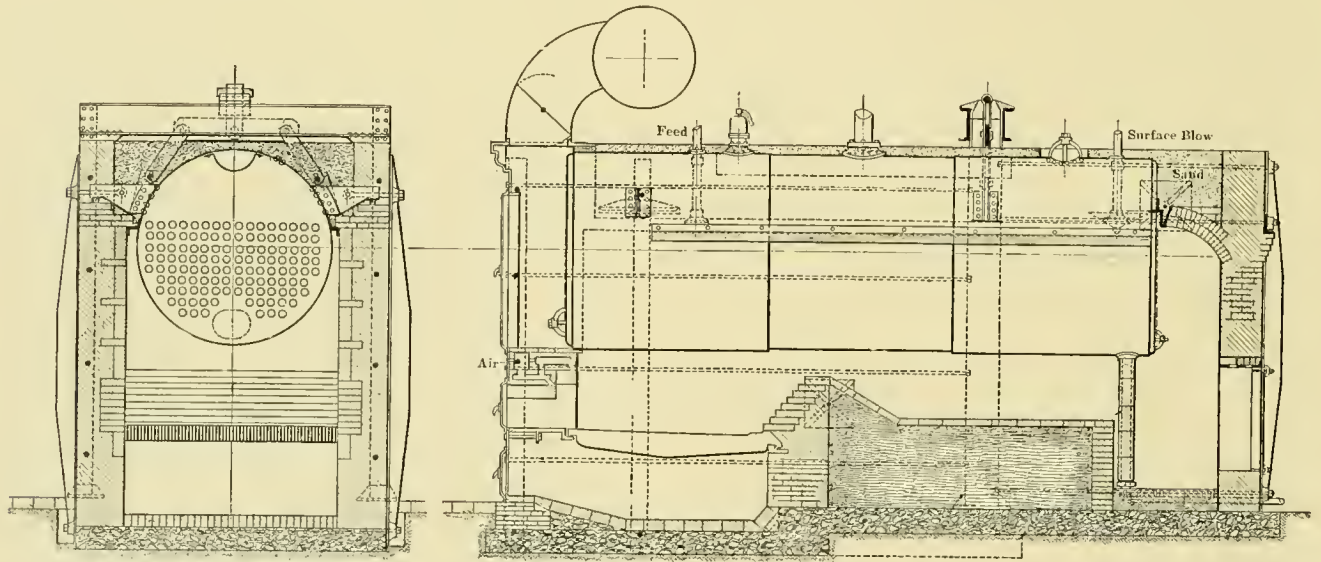


FIG. 1.—HANGING AND SETTING FOR HORIZONTAL TUBULAR BOILER.—FIG. 2.

the shell, for brickwork is quite capable of accommodating itself if you will only give it a chance.

Fifth.—After providing perfect means for the movement of the shell, fore and aft, it would avail us nothing if we are to brick the shell in solid in the usual way (but we are not), for every rivet head and lap serves to anchor the shell in the brickwork as mentioned before, resulting in cracking and general dilapidation of the walls. To overcome this I rivet a heavy 3-in. Z bar to the shell on each side. The outer face of this bar is straight and smooth, and up against it I bring the inside face of the furnace wall, and over the top of this Z bar carry two courses of brick to within an inch or two of the shell of the boiler, thus closing the joints as plainly shown on the drawing. Bearing in mind that the rear point of suspension exerts no influence to crowd the boiler sideways, it is logical to assume that its movement, fore and aft, will be perfectly free from the brickwork on the sides.

Sixth.—With the above arrangement alone we will not yet be free of all brickwork, for a rear cross wall must be considered. Therefore we provide a heavy V-shaped cast iron beam placed across the back chamber, securely masoned in at each end. This beam is placed away from the boiler head about  $1\frac{1}{4}$  inches. This is shown in large scale

finds it necessary to stand upon it. Back of this arch, on the outside of the rear cross wall, is placed a buck stay, anchored by bolts extending through to the upright steel supports. This takes the thrust of the arch, which will then last indefinitely.

The foregoing completes a combination of iron and brickwork for hanging and inclosing a boiler of any size and even any number of them, leaving them free to take such position as heat and cold demand without straining any part or crowding the brickwork out of shape, and furthermore permits the removing of the fire brick lining without disturbing the main setting, and if for any cause the entire brickwork is required to be removed it can be done without interfering with the position of the boiler, for the rear suspension with the two-thirds load takes care of itself, while it is simply necessary to suspend temporarily the forward light load by catching the steel ears through the buck-stay bolt holes, thus leaving full clearance to work below.

The following are accessories which I have found to possess practical merit, Fig. 3:

First.—Where a blow-off pipe is preferably located at the rear, I use a fire-clay sleeve, which can now be readily procured in the market, being made of different sizes and pro-



vided with male and female ends. Simply slip on a few of these over the blow-off pipe, first placing in a little fire-clay paste between the ends, forcing them together and holding them there by a collar and set screw.

These sleeves will preserve the pipe, located as it is in the hot gases, for a great length of time, doubtless as long as the boiler will last. It is shown on Fig. 3, and is marked B and B'.

Second.—The cleaning out door and frame is simple and cheap, but perfectly air-tight. This is shown in detail on Fig. 2, and is marked C and C'.

There is an annular recess on the face of the frame about  $1\frac{1}{4}$  in. wide and 9-16 in. deep, into which is filled fire-clay

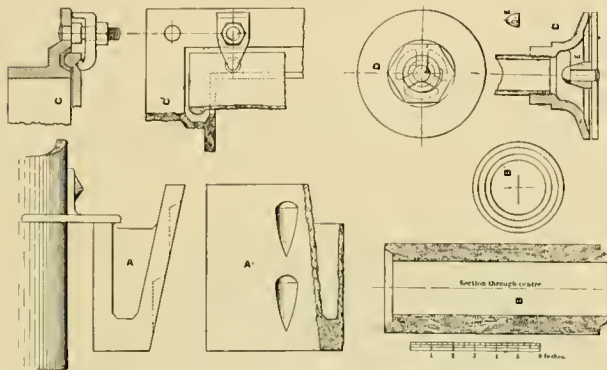


FIG. 3.—DETAILS OF SETTING.

paste when the door is ready to be closed. The inside face of the door, around the edge, has cast on it a half round bead, which, when the door is closed, forces itself into the fire-clay and forms an absolutely air-tight joint, regardless whether the casting is smooth and true or otherwise. No tooling is necessary.

At the two corners of the door opposite the hinges are riveted studs on which lipped straps fit instead of a latch. These have been found better than a latch, which requires to be forced together a certain degree before it will catch, but the strap and stud can be screwed up till the joint is made snug and then left.

Counter-sinking a spot in the back of the door for the lip of the strap to fit in assures the strap standing in its proper place whether a man closes up the door in the light or in the dark. Furthermore, it is a very cheap door to make, besides being air-tight. It is not necessary to apply clay every time the door is opened and closed, for it will be found that this clay will not easily drop out.

Third.—The feed head shown in detail on Fig. 2, and marked D and D' is, I think, a great improvement over the common perforated pipe. It produces what could properly be termed a film feed as distinct from a spray feed. My object is to avoid the discharge of a large body of water and yet maintain the necessary volume, and at the same time prevent as much as possible a liability to choke up or get out of order in any way. The one shown here is, in my estimation, correct for a reliable feed head or nozzle, and is withal simple and cheap.

The cut showing the side elevation of the boiler gives a pretty clear idea of the chambered and perforated arch over the fire door. This is made up of special arch brick. Some eight years ago I designed this arch for a plant which had had great difficulty in getting an arch to stand twelve

months. There has been no trouble since. The peculiarities of bridge wall construction and such other details as go to make up a substantial and practical setting I will not go into here, for most engineers have their own ideas, and time is too fleeting to argue minor matters about a boiler installation.

\* \* \*  
**Oil Filter for Boiler Feed-Water.**

At the Buffalo Convention of the American Water-Works Association, June 14-16, 1898, Dabney H. Maury, Jr., superintendent of the Peoria (Ill.) Water Company, presented a paper describing the difficulties met with in endeavoring to filter the condensed steam in the plant of which he has charge, and the filter finally constructed.

Over two years ago it was decided to use the condensed steam, adding as little fresh feed water as possible in order to reduce the amount of scale deposited in the boilers. Gravity filters were decided upon because the air-pump returning the water to the hot-well was already so loaded that a pressure filter could not be used.

Filters were tried in which it was attempted to separate the oil by means of sponges, cotton waste, straw, hay, excelsior and coarse cloth, but without satisfactory results. It was then decided to try sand and coke and two old cocoanut-oil tierces were fitted with the necessary inlet pipes, strainers, outlets, valves, etc., and into one was placed about 4 ft. in depth of screened sand, while the other was charged with 1 ft. of powdered coke on top of 3 ft. of sand. The effluent from these crude filters seemed slightly better than the raw water but the improvement was hardly noticeable. The results seemed to show, however, that a much slower rate of filtration might be successful, so a sand filter consisting of three compartments, each of twice the area of one of these tierces, was designed and ordered built.

The new filters were put in operation August 27, 1897. A steel tank is divided into three equal compartments, known respectively as Filters Nos. 1, 2 and 3. All these filters are generally used at once. When one requires cleaning it can be shut out and cleaned without interrupting the use of the other two. The area of each filter is about 12.25 sq. ft. Filter No. 1 contains crushed quartz, while filters Nos. 2 and 3 contain screened sand. The depth of quartz and sand in each filter is about  $3\frac{1}{2}$  ft. The raw water is raised by the air pumps from the condensers through the 3-in. pipe at the right of the tank into the 12-in. cast-iron distributing pipe over the filters. This water is freed from air by the two risers shown. Three 1-in. valves, A1, A2 and A3, admit the raw water through a gridiron of perforated pipes to the top of the sand. In the bottom of each filter are 30 strainers connected to the 2-in. outlet pipe. These strainers are simply brass cups threaded at the bottom with  $\frac{1}{2}$ -in. male pipe thread, and covered on top with fine brass wire gauze stretched and soldered, for strength, over heavier wires, which in turn are soldered to the cups. The 2-in. valves, E1, E2 and E3, regulate the outflow from the filter to the hot well. The  $1\frac{1}{2}$ -in. valves, D1, D2 and D3, control the clean water from the city mains used to wash the filters, while O1, O2 and O3 are  $\frac{3}{4}$ -in. valves on the steam line used when necessary for heating the wash water. Plugs in the 3-in. line at B1, B2 and B3 are employed instead of the more costly and cumbersome valves for opening or closing the overflows or wastes from the filters while washing. The overflow or wash water runs out through the pipes on the

left of the tank to the sewer. While washing, the sand is from time to time stirred with a hoe or paddle. For taking samples of the effluent, while the filters are running, the three 1/4-in. angle valves, C1, C2 and C3, are provided. These valves control 1/4-in. pipe lines tapped into the outlet pipes inside the filters and terminating at their outer ends just below and behind the effluent pipe line. To take a sample from Filter No. 1, for instance, the 2-in. outlet valve, E1, is closed, and the 1/4-in. angle valve, C1, is opened, and the water flowing from the quarter-inch pipe is caught in a bottle or other suitable vessel. The tank is supported on a framework of oak resting on concrete foundation. A steel ladder gives easy access to the board platform from which the upper parts of the tank can be readily reached.

Before this filter was put into service, and during the period in which we were trying to use as much condensed

Approximate total condensed steam, 34,865,000 lbs.  
 Percentage of fresh water in total feed water, 9.2 per cent.  
 Percentage of condensed steam in total feed water, 90.8 per cent.

Analysis of Fresh Water, Grains per Gallon.

Nitrate of potassium.....	0.617
Nitrate of sodium.....	0.294
Chloride of sodium.....	2.598
Sulphate of sodium.....	2.407
Sulphate of magnesium.....	3.213
Carbonate of magnesium.....	0.205
Carbonate of calcium.....	15.917
days.	

Time consumed in washing as follows: Water is allowed to run slowly from the city mains with a little steam if necessary for about 1 1/2 hours. The sand is stirred at intervals for a few Oxides of iron and aluminum..... 0.046  
 Silicic acid ..... 0.810

Total ..... 26.137

Water is remarkably clear and contains nothing in mechanical suspension. Hardness of fresh water, 20° by Clarke's scale.

Kind of oil used in cylinders, Kellogg's opaque anti-corrosive cylinder oil.

Total cylinder oil fed into main engines, 48 gallons = 192 qts. = 0.7 qt. per day.

All of this oil went into the engine cylinders and passed thence through the condensers to the filters, except such oil as may have been caught by the condensers.

Total cylinder oil fed into auxiliaries, 46 gallons = 184 quarts = 0.67 quarts per day.

An unknown proportion of this oil was removed by the Austen separator on exhaust pipe line from auxiliaries to hot well and did not get into the boilers.

Average temperature of condensed steam entering the filters from the air pumps, 56° F. This low temperature is due to the low temperature of the condensing water (50° F.) and to the large area of condensing surface. The water generally leaves the filters several degrees warmer than it enters.

Number of washings of filters in 276 days: Filter No. 1, 11 washings; No. 2, 9; No. 3, 11.

Average number of days each filter ran without washing, 26.7 days.

Time consumed in washing as follows: Water is allowed to run slowly from the city mains with a little steam if necessary for about 1 1/2 hours. The sand is stirred at intervals for a few minutes at a time. The washing is done by the regular fireman on duty at the time.

Area of each filter, 12.25 sq. ft.

Depth of sand or quartz, 3 1/2 ft.

Rate of filtration: In lbs. per hour, 7,426; in gallons per hour, 89.5; in cubic feet per hour, 11.88; in gallons per acre per 24 hours, 2,546,024; in vertical inches per hour, 3.87.

Cost of filter for concrete foundation, oak frame, steel tank, screened sand, crushed quartz and such pipes, valves and fittings as were not in stock.....\$135.00

Estimated value of material used from stock..... 55.00

Total .....\$190.00

Most of the pipe fitting was done by the regular pumping station crew; all other labor is included in the first item.

Repairs to boilers since filters have been in service, none.

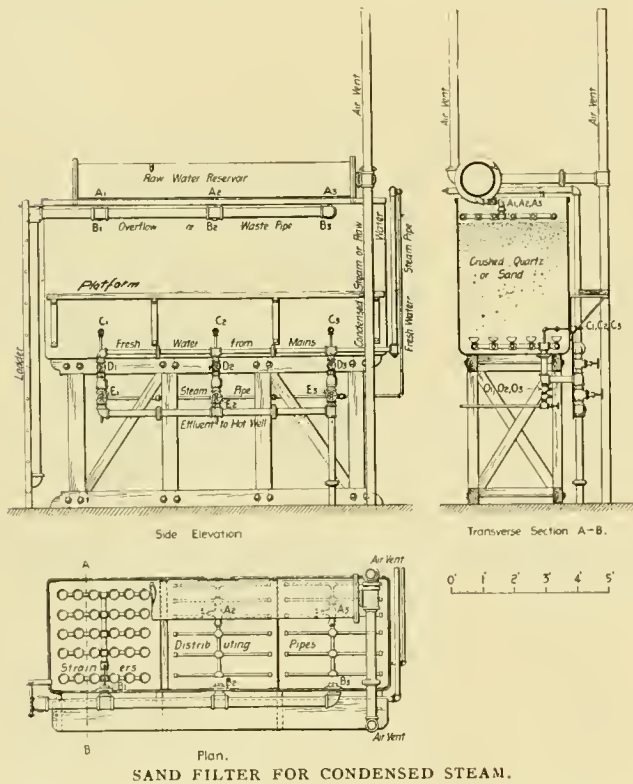
Repairs to filters, none.

Annual saving in boiler compound, \$175.

Estimated annual saving in coal, due to absence of oil and scale, 10 per cent of coal bill, \$400.

There is also a large annual saving in repairs to boilers and in boiler cleaning, but the actual amount of this is difficult to estimate.

Observations of the working of the filter show that at first, after cleaning, the filtration is not as thorough as after the filter has been running a few hours. This is doubtless due partly to the fact that the sand is loosened up by the washing and requires time to settle again and close the



SAND FILTER FOR CONDENSED STEAM.

steam as possible instead of fresh water, the oil in our boilers was giving constant and very serious trouble. The lowest row of tubes in each boiler buckled up from 4 to 7 ins., and leaked almost without exception. It was necessary to shut down at least once a week and swage up, and frequently to renew the tubes in this row. There was little or no scale in the boiler, but a brown gummy or viscous coating was found, especially near the bottom of the rear water leg and in the lower tubes. Since Aug. 29, 1897, the record is very different. There has never been a shut down to repair a boiler, and no new tubes have leaked. Boilers are kept under steam constantly day and night from two to four months, and when opened show only a soft scale of a maximum thickness a little greater than that of blotting paper.

Below follows a detailed statement of the conditions under which the filters and boilers were operated:

Period covered, August 29, 1897, to May 31, 1898, 276 days.

Actual time pumps and filters were running, 4,695 hours.

Approximate total evaporation of feed water by boilers, 38,383,000 lbs.

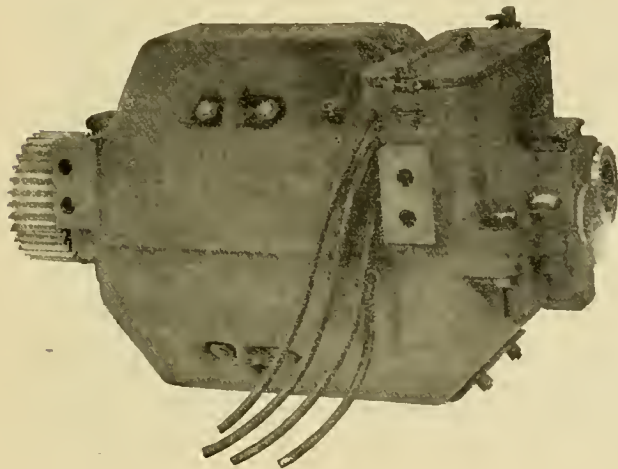
Approximate total fresh water, 3,518,000 lbs.



voids, and partly to the fact that the film of oil formed over the top of the sand after the filter has been running a short while, materially aids the filtration. It was difficult to tell whether the sand or the quartz was the more efficient filtering medium, but it is believed that the best results under equal rates of filtration were obtained from the quartz. In every instance, however, it was noted that slower filtration increased the efficiency of the filter. Before making the filter several prominent filter men were consulted and they stated that no patents would be infringed by its construction.

**A HIGH SPEED MOTOR FOR SUBURBAN SERVICE.**

The different kinds of service rendered by the city, suburban and elevated lines of the electric railways require the development of motors suited with respect to power and speed for each grade. The motors on the Nantasket Beach and the Hartford, New Britain & Berlin lines of the N. Y., N. H. & H. R. R. Co. and those for the electric locomotives in



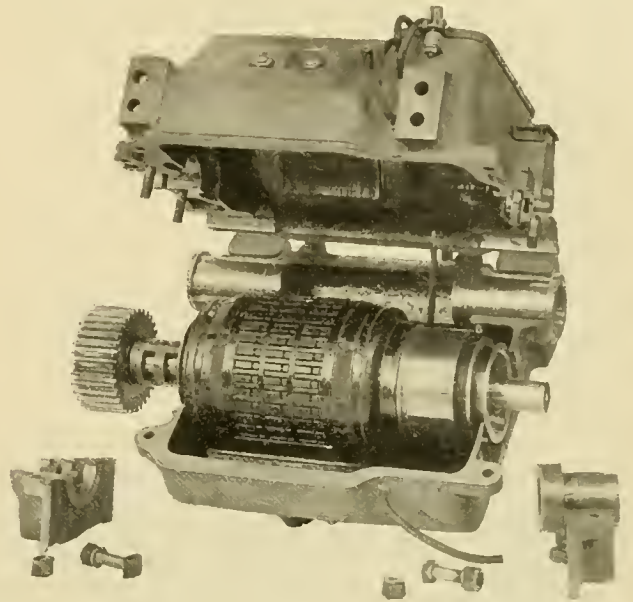
FRONT OF MOTOR—CASE CLOSED.

the Baltimore & Ohio tunnel are very heavy and powerful. The motors on the Cleveland, Painesville & Eastern Railway and the Lorain & Cleveland Railway are not so large but operate the cars at a very high rate of speed. These, together with many other railway motors which have replaced steam locomotives on elevated and surface roads, are the product of the General Electric Company, and have invariably given satisfactory speed, greater capacity and better satisfaction than the locomotives.

Exhaustive tests on motor cars and locomotives have been made to obtain reliable data for determining the best form of construction necessary to meet the different requirements. The data secured from these experiments and from the operation of the various roads formed the basis for the development of a new motor especially adapted for medium heavy railway work, as required for suburban and elevated railways. It will be known as the G. E. 51-B and will have a rated capacity of 80 h. p. A double equipment of these motors with a gear ratio of 2.27 will propel a 20-ton car at a maximum speed of 26 miles an hour on a level track.

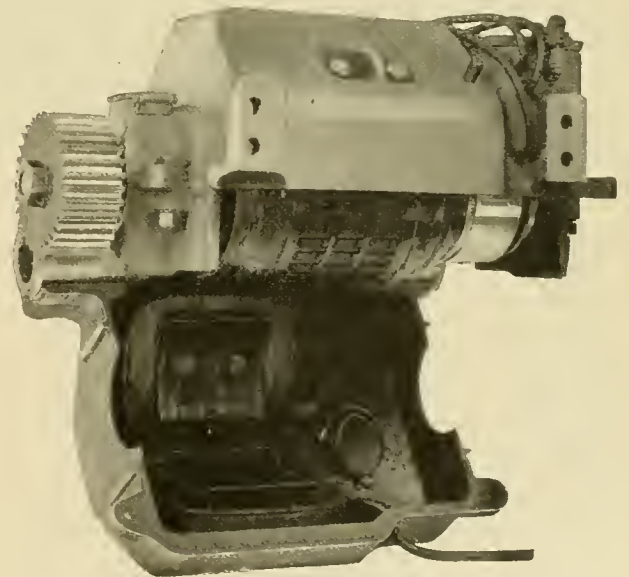
The frame of the motor is of cast steel made in two bowl-shaped halves bolted together, being dust and water proof. In the upper casing there is a large opening, which has a

dust proof cover held in place by a cam locking device, for the inspection of the commutator and brush holders and for replacing the brushes. A hand hole in the lower frame at the commutator end permits the removal of any foreign sub-



MOTOR WITH ARMATURE DROPPED FOR REMOVAL.

stance in the bottom of the motor. The upper support of the linings for the armature bearing is part of the upper half of the motor frame; the lower support is a cap bolted to the upper support. The armature can be held in the upper half while the lower part of the frame is dropped but it may be



MOTOR WITH LOWER HALF OF CASE DROPPED.

removed with the lower half. The cored recess between the inner ends of the lining and the motor frame is occupied by a combination thrust collar and oil guard, an open space being left at the bottom for an outlet for oil, thus preventing any grease from working into the motor windings. Felt wicks extend through the lining and convey a continuous supply of oil to the shaft. The armature bearing is 3x6<sup>3</sup>/<sub>4</sub> in. at the commutator end and 3<sup>1</sup>/<sub>4</sub>x9<sup>1</sup>/<sub>2</sub> in. at the pinion end.

The axle bearings are 9 in. long and a diameter to correspond to the shaft.

The motor has four laminated pole pieces with projections supporting the coils which are slipped over them. They are secured by bolts passing through the frame and fastened with nuts on the outside. The field coils are of copper ribbon wound on metal spools and insulated between turns with asbestos.

The armature is of the iron-clad, hollow core type 16 in. in diameter and 10½ in. long. The core is built up of well annealed laminations provided with ventilating ducts, the laminations being assembled directly on the shaft. The core has 37 slots, each slot containing three insulated coils giving the armature 37 sets of coils with 111 leads, corresponding to the number of bars in the commutator. Each armature is subjected to a test with alternating currents at 2,500 volts. The pinion is made of cast steel with machine cut teeth, and bored for a taper fit on the armature shaft.

### COMBINATION CARS IN NEW YORK.

The combination car, shown in the illustration, is an innovation on the lines of the Third Avenue Railroad Company, of New York. The car was built in the shops of the company and is intended to take the place of the trailers, one small open and a small closed car, such as are run on the lines in the summer time. It is also intended in this way to comply with the rule of the board of health which requires that a certain number of closed cars shall be run on each line, even during warm weather.

The car is made up of a 16-ft. body of a closed trailer car and a small open grip car. It is 25 ft. between truck centers and 41 ft. over the bumpers. The grip truck which is under the closed portion has a 4-ft. wheel base, and the rear truck a wheel base of 3 ft. 9 in. with inside bearings. Outside bearings could not be used on the rear truck on account of the swing of the truck which interfered with the side steps.



COMBINATION CAR BUILT FROM OLD CAR BODIES.

Both gears and pinions are from the General Electric Company's gear plant at Lynn.

The commutator is 11½ in. in diameter with 111 segments built up and securely clamped on a malleable iron shell. The segments are of the best hard drawn copper 6¼ in. long with a wearing depth of 1 in. To insure perfect insulation every commutator is tested with 500 volts direct current between adjacent segments, and 5,000 volts alternating current between the segments and the shell.

The brush holders are of cast brass and each is arranged to hold two carbon brushes which slide in finished ways and are pressed against the commutator by independent pressure fingers giving a uniform pressure throughout the whole working length of the brushes. The brush-holders are offset ¼ in. to prevent the wearing of grooves in the commutator and are clamped to a well seasoned hard wood yoke filled with moisture proof compound bolted to the top magnet frame and easily removable through the opening over the commutator.

Mounted on 33-in. wheels the clearance between the bottom of the frame and rails is 3 in.; that between the bottom of the gear case and rail is 4 in.

The closed portion of the car has a seating capacity for 20 passengers and the open part for 25. The combination car is a very comfortably riding one and is welcomed as a substitute for the trail cars as it obviates the jerking and bumping together of the cars in starting and stopping.

### TROLLEY CARTAGE IN CHICAGO.

The Chicago General Railway, which has some 30 miles of track so located that it intersects no less than 17 of the steam railroads entering the city, and with a line to the Stock Yards, has under consideration the organization of a department to conduct a trolley line cartage business from the many factories along its lines to the depots of the railroads. It is proposed to construct switch tracks into all such factories and along the steam tracks of the railroads, and use flat cars of from 10 to 15 tons capacity in conducting the cartage business.

The Rochester Railway Company has adopted the portable fare box on the University and Lyall avenue cars.



## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

**Remedy of Judgment Creditor is to Levy upon Franchise.**

*Williams v. East Warcham, Onset Bay & Point Independence Street Railway Company (Mass.), 50 N. E. Rep., 646. May 18, 1898.*

The supreme judicial court of Massachusetts holds that the remedy of a judgment creditor of a street railway company is not, under the law of that state, to have a receiver appointed, but is to levy his execution upon the franchise of the company, and the rights and privileges thereunder, "so far as [they] relate to the receiving of toll," and upon "all other corporate property real and personal," and a sale thereof, pursuant to section 31, and following sections, of chapter 105, of the public statutes of that state. It takes this position, because it thinks that a street railway company is a corporation authorized to receive toll, within the meaning of sections 30-35 of said chapter 105, in which respect it says that it cannot distinguish it from a railroad corporation.

**Rushing Across Track in Rear of Passing Car.**

*Greengard v. St. Paul City Railway Company (Minn.), 75 N. W. Rep., 221. May 9, 1898.*

The evidence here made a case of an adult, in the full possession of all his faculties, with knowledge of the situation and the attendant risks, with ample opportunities to ascertain the approach of cars, with nothing to distract his attention, and without any necessity or even occasion for taking chances, rushing hastily across one track, at a point not a street crossing, in the immediate rear of a passing car, without knowing, or taking any reasonable means to ascertain, whether a car was approaching from the opposite direction on the other track. This, the supreme court of Minnesota holds, so conclusively showed contributory negligence on his part that a judgment entered in his favor must be reversed and one entered for the company, regardless of the verdict of the jury in his favor. Nor does it consider that the fact that the car coming up on the second track may not have given any signal of its approach at the street crossing over half a block away at all tended to excuse the man's conduct.

**Lien for Engines but Not for Construction of Electric Road.**

*Frick Company v. Norfolk & Ocean View Railroad Company (U. S.), 86 Fed. Rep., 725. March 16, 1898.*

The United States circuit court of appeals holds that a mechanic's lien law, such as that of Virginia, giving a prior lien to all persons furnishing "engines . . . necessary to the operation of any railway, canal, or other transportation company," includes engines furnished for the purpose of generating electricity for the propelling power on an electric railway, and that such engines are not a part of the permanent construction of the railway so as to be embraced within a supply lien law.

It also holds that where a railway company furnishes all the materials, a person who furnishes the work and labor necessary for grading the roadbed, laying tracks, and erect-

ing trolley poles and wires, at so much per lineal foot or per mile of track, using his own tools for the work, is a "contractor" with the railway company, and not a "laborer," within the meaning of statute giving a prior lien to "laborers," and, likewise, not entitled to a lien under a supply lien law.

**Agents Can Dicker Away in Settling Claims.**

*Kane v. Chester Traction Company (Pa.), 10 Atl. Rep., 320. May 16, 1898.*

After negotiations for a settlement had been carried on over a period of several weeks, if not months, where \$1,000 had at first been demanded, and \$100 had been offered, to settle a claim for personal injuries, a compromise was at last effected, a formal release under seal being executed. But dissatisfaction grew upon the claimant, owing to a belief that she ought to have got more, and that her injuries were greater than she had thought. She then went into court, and endeavored to have the release set aside on the ground that it had been obtained from her by fraudulent representations made by the agent who settled the claim with her—assented to, if not actively participated in, by a supposed friend of hers, whom she had brought in as adviser—that if she went to law she would get nothing, etc. Referring to this, the supreme court of Pennsylvania says that it is quite probable that the agent was not over nice in his mode of urging the delays and disadvantages of a lawsuit, and the small amount the claimant might actually receive, even out of a substantial verdict. His methods may have been overzealous, but, the court says, they were not shown to have amounted to fraud. If the claimant had been a merchant selling goods, and the company a purchaser depreciating their value in the dicker, the court goes on to state that it could not say that the latter had exceeded the license allowed by the standard of commercial honesty, and that there was no reason to hold these parties to any stricter rule.

**Duty in Regard to Inspecting Harness.**

*McKnight v. Brooklyn Heights Railroad Company (N. Y.), 51 N. Y. Supp., 738. May, 1898.*

Judge Gaynor holds, at a trial term of the supreme court of New York, in Kings county, that, in view of the fact that it is common knowledge that there are certain defects from wear and tear in the straps, buckles and fastenings of a harness which may not be discovered with the exercise of reasonable care when it is upon a horse, especially by a cursory or limited examination, a street railway company owes to its drivers the duty of reasonable care in the inspection of harness in the stable; and that the employment of competent persons to make such inspection does not fulfill its duty. It remains responsible for the actual making of such inspection, and liable to the drivers for any negligence of its inspectors in the making of the inspection.

Nor can exemption from this liability be attained, he further holds, by promulgating a rule requiring drivers to examine the harness before starting out. How much of an ex-

amination can be made by them is a question of fact. They are not by such a rule made responsible for the consequences to themselves of all defects in the harness, but only of such defects as the rule contemplates, viz., such as can with reasonable care be found by such an examination as they are given opportunity to make. The employer cannot shift upon its employes its responsibility for injuries to them from defects in appliances from wear and tear, by devolving on them the duty of inspection, without giving them time and opportunity to make such inspection as will reveal the defects.

#### Duty Owed to Passenger Permitted to Stand on Step.

*Schaefer v. Union Railway Company (N. Y.), 51 N. Y. Supp. 431. May 6, 1898.*

Whether it was contributory negligence for a man who had boarded a crowded car and could not maintain a position on the platform to take one upon the step, the first appellate division of the supreme court of New York holds, was clearly a question for the jury to determine, under all the circumstances of the case. On the other hand, it declares that the company, having received him as a passenger and permitted him to stand upon the step, owed a duty to take reasonable care that he was not exposed to unnecessary danger. And, upon the fact that the car was permitted to go down an incline at a very high rate of speed; that it was crowded with passengers, inside and out; that while going at that rate of speed it struck a curve; that the passengers had no warning of the approach of the curve; and that the car lurched so that several passengers besides the one suing were thrown down, it says the jury might well have predicated negligence on the part of the company. No evidence was given in this case by the company except the testimony of its claim agent to the effect that the conductor and motor-man were required to make reports of anything and everything which occurred during their trips, but that in this particular case they neglected their duty, and he never heard anything about it. This, the court suggests, may have been important as explaining the reason why the company gave no proof about the accident, but otherwise it was of no consequence in the case, which, under the circumstances, must stand upon the evidence presented by the party suing.

#### Consent of Property Owner Does Not Cover After-Acquired Property.

*Taylor v. Erie Passenger Railway Company (Pa.), 40 Atl. Rep., 316. May 9, 1898.*

Certain owners of property fronting on a certain road granted to the Erie City Passenger Railway Company and its lessees the right to occupy and extend their line of railway, with the necessary turnouts, and to operate the same through and along said road "in front of our respective properties, to Trinity Cemetery," the company being released from all claims for damages for the occupation of said road, or so much thereof as might be necessary for the right of way for tracks, and from any and all other damages such property owners might sustain by the construction of said railway and its operation which might be unavoidable by its construction and operation. But this permission, the supreme court of Pennsylvania holds, was effective only as to the respective properties owned, by the parties who gave

it, at the time it was given; and that a person who had signed it, on subsequently buying other property on the road, would have all the right to object to the extension of the railway in front of the latter property that his vendor would have if still the owner of the same, and to make his objection effectual with an injunction.

It also holds that, although the fact that the company had constructed its railway in front of certain property in 1889 and had used and operated it since without objection gave it the right to there continue its railway as so constructed, and the right to continue the use and operation of the same, this did not give it any right to construct an additional switch, or to remove and enlarge one previously constructed in front of said property, so as to increase the damages thereto, without the consent of the owner.

#### Municipalities Have No Inherent Power to Confer Exclusive Privileges.

*Detroit Citizens' Street Railway v. Detroit Railway (U. S.), 18 S. C. Rep., 732. May 23, 1898.*

The supreme court of the United States holds that the common council of Detroit had no inherent power to confer upon the Detroit City Railway Company, by an ordinance passed in 1862, the exclusive authority to construct and operate railways on and through the city streets and avenues for a period of 30 years, which an ordinance of 1879 purported to extend for 30 years from that date.

Nor does the supreme court consider that such power was derived from the tram-railway act under which the company named was organized, and which provided that all companies or corporations formed under it for the purpose of constructing and operating railways in and through the streets of any town or city in the state "shall have the exclusive right to use and operate any street railways constructed, owned or held by them: provided, that no such company or corporation shall be authorized to construct a railway . . . without the consent of the municipal authorities, . . . and under such regulations and upon such terms and conditions as said authorities may from time to time prescribe." It maintains that to confer the power on a municipality to grant an exclusive privilege to occupy its streets for railway purposes such power must be given in language explicit and express, or necessarily to be implied from other powers, which was not done in this case.

To conclude with, the supreme court says that easements in the public streets for a limited time are different, and have different consequences, from those given in perpetuity. Those reserved from monopoly are different, and have different consequences, from those fixed in monopoly. Consequently those given in perpetuity and in monopoly must have, for their authority, explicit permission, or, if inferred from other powers, it is not enough that the authority is convenient to them, but it must be indispensable to them.

#### Must Pay for Injuries Caused by Flames Frightening Passenger into Jumping From Car.

*Poulsen v. Nassau Electric Railroad Company (N. Y.), 51 N. Y. Supp., 933. May 24, 1898.*

Unanimously does the second appellate division of the supreme court of New York affirm a judgment for \$7,500 dam-



ages for injuries sustained by a woman who jumped from an electric car while it was still in motion because of flames flashing high up out of the controller box at the front end of an open trolley car.

In defense, the company undertook to establish that the controller was a standard appliance, in use, and properly so, throughout the United States; that no system of inspection can prevent flashes escaping from the box containing the controller; that even new controllers of this standard type will produce these flashes; and that, in the ordinary use and management of such controllers, particles of dust or grease collected therein will cause such flashes.

But the court thinks that this explanation "did not explain." After making all due allowances, it emphasizes the fact that it was not shown that there was any inspection of the car in question at any time during the day before the hour of the accident, let alone any before it left the depot on the trip in question, while the controller itself was out of order, as was easily discoverable, and was discovered right after the accident.

It also considers it a significant fact that the motorman was not called as a witness, and that no explanation of his absence was offered—a fact which the jury were entitled to consider in judging of the cause and character of the flashing or flaming which alarmed the passenger.

And it suggests that another ground upon which negligence may have been imputed to the company arose out of the fact that, after the flashing or flaming began, the motorman permitted the car to continue its course without stopping to ascertain the cause of the flame, until a new element of apprehension was introduced, namely, the burning out of the fuse.

The court says that the jury were entitled to take this last matter into consideration in passing upon the company's negligence; so that whether the accident was caused by failure of inspection and the consequent use of a car of which the controller was not in good order, or whether it resulted from the continuing motion of the car after its dangerous condition might have been and was discovered, the jury were justified in assuming the company's negligence.

Nor does the court consider that the fact that other passengers remained in the car conclusively established contributory negligence on the part of this one in jumping.

#### Where Trolley Poles May and May Not be Placed.

*Snyder v. Ft. Madison Street Railway Company (Ia.)*, 75 N. W. Rep., 179. May 10, 1898.

The supreme court of Iowa takes the position that streets are designed for public uses, among which are the construction and operation of street railways; and if they are so constructed and operated as not to affect prejudicially the rights of the public, nor to interfere with the proper use of the street by others, no burden not contemplated by dedication of the street is placed upon it. In such cases the kind of power used in operating the railway, it considers, is wholly immaterial.

That trolley poles and wires might be so erected and arranged as to have the effect of being a permanent obstruction of the street for the benefit of the street railway that would necessarily interfere with the proper use of the street by others, it says, is undoubtedly true, but the mere fact that the spaces they occupy cannot be used for other pur-

poses, it insists, does not show an improper use of the street. They are designed to aid in the rapid, convenient, and economical transportation of persons from place to place, and thus to facilitate the use of the street by the public for whom it was intended.

It follows, the court holds, that an abutting lot owner has no sufficient ground to complain of the erection and maintenance of street railway poles in the street in front of his premises if they are properly placed, and this is true whether he owns what is technically termed the fee of the street or not.

On the other hand, it holds that a petition stated a good cause of action which alleged that a pole was placed in front of certain property without necessity therefor, to annoy the owners, and to injure and depreciate the value of the property, which it had done, causing great damage to them, and would continue to do, if not removed, obstructing the enjoyment by them of their property, for which they had not been compensated. And if these averments could be proved, it says, they might recover damages for the injuries sustained; but they were not compelled to resort to that remedy, as they might have recourse to an action for the removal of the pole, if its location was not only injurious, but unnecessary.

Still, the court does not want to be understood as holding that a property owner may dictate the location of poles in front of his premises, nor that he may recover damages, however trivial, which may be caused by their location. It says that the railway company has the right to so place its poles as to secure the best results for its railway, provided that it so places them as not to cause any unnecessary injury. The injurious consequences which it must guard against are those of a substantial character.

The placing of poles in front of property, it goes on to say, is seldom desired by the property owner, and may in some slight degree interfere with the use of his property, as by obstructing the view from it; but for such injury alone he would rarely, if ever, be entitled to relief. The placing of a pole in a walk or roadway, however, or in front of and near to an important window, if the pole could as well be placed elsewhere, might afford ground for relief.

And, after all, the court says it cannot undertake to lay down general rules which would govern all cases. Each case, of necessity, must be decided according to its own facts.

#### Liability for Negligent Killing of Dogs on Track

*Citizens' Rapid Transit Company v. Devo (Tenn.)*, 45 S. W. Rep., 790. Feb. 9, 1898.

In the earlier law books it was said that "dog law" was as hard to define as was "dog Latin," but the supreme court of Tennessee declares that day has passed, and that dogs have now a distinct and well-established status in the eyes of the law. Giving vent to a bit of sentiment, it says, they are the negro's associates, and often his only property, the poor man's friend, and the rich man's companion, and the protection of women and children, hearthstones, and hen-roosts.

Holding this view, it will readily be understood that it would affirm a judgment holding a street railway company liable for the killing of a dog when it was convinced that the company was guilty of negligence in the killing of the dog, or in fatally injuring it so that it was an act of humanity for the owner to kill it.

It holds that it was not error in the trial judge to charge that the street car company must have sufficient employes on its cars to operate them in a careful manner, so as to prevent damages or injuries to persons and animals that might go upon the track, and was liable for a failure to do so; the question of what number would be sufficient being left to the jury, under all the circumstances. And this charge, it says, was called for by the fact that the motorman had stated that the reason he did not see the dog sooner was because he was looking around at the passengers to see if any desired to get off, the conductor having left the car after it passed from the more crowded portion of the track nearer the city, the motorman being at the time the only employe on the car, which was being run on a track laid on a turnpike which was a public thoroughfare much used.

Nor does the court consider that it was error to charge that, inasmuch as the street car was laid on the roadway and on the same level with it, the dog was not a trespasser if he went upon the track, inasmuch as the dog was not improperly on the highway. Additional scope would seem to be given to this point because, while the dog was running along 150 or 200 yards in front of its master, it had stopped in the center of the track to "point" some birds.

And although the jury might unquestionably take into consideration common knowledge and observation about the habits and qualities of dogs, the court insists that it was going too far to say that the motorman might rely upon the quickness and celerity of the dog, and thus absolve himself from all duty and care to prevent the accident.

Upon the question of value, the court holds that it was competent to admit evidence of the dog's pedigree and of the qualities and performances of its ancestors. And it finds no fault with evidence that was introduced showing that the dog had had the distemper and that this added to its value 100 per cent.

The amount of the judgment against the company, which the supreme court affirms with costs, was \$250. And had the jury found that the dog ought not to have been killed, the court says its owner would still have been entitled to damages for his injuries, the action being for both the negligent injuring and killing of the dog.

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#### Liability to Passenger Struck While Alighting from Wrong Side of Car.

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*Atlanta Consolidated Street Railway Company v. Bates (Ga.), 30 S. E. Rep., 41. Jan. 21, 1898.*

There is some apparent conflict in the authorities as to whether the relation of common carrier and passenger exists after the passenger has alighted from the car, and before he has had opportunity of passing over and beyond a parallel track of the company's line. But the supreme court of Georgia holds that the relation certainly exists while the passenger is in the act of alighting. It maintains the doctrine that the relation of common carrier and passenger exists between a street railway company and a passenger until he has reached his destination, and has had a reasonable opportunity to alight safely from the car; and that the carrier, during this period, is under a legal obligation to use extraordinary diligence, on behalf of itself and its agents, to protect the life and person of the passenger.

This doctrine of extraordinary diligence, it goes on to state, is not only applicable to the agents of the carrier on

the car on which the passenger is traveling, but also to its agents having control of another car, approaching on a parallel track, after the latter have discovered that the former car was about to stop for the purpose of discharging passengers, who might alight dangerously near such parallel track.

To the ordinary traveler upon foot, the court holds, the motorman on the approaching car is bound to exercise only ordinary care and diligence, while to the company's passengers he is bound to use extraordinary care and diligence, at a street crossing. Especially is this the case when the motorman knows, or has reason to believe, that passengers are about to alight from the car that has stopped, and that they might alight dangerously near the track upon which he is running.

The habit or practice of the passenger suing the company as to his manner of departing from street cars on other occasions, either before or after the injury complained of, the court holds, cannot be legitimately considered by the jury as throwing any light upon his conduct at the time he was injured.

It having been alleged that one element of negligence which resulted in the passenger's injuries was that the street railway company knew it was dangerous to allow passengers to alight from a car on the side next to its parallel track, yet took no steps to prevent it, the court holds that it was not error to admit testimony showing that the company had placed no ropes, guards or other protection to prevent passengers from incurring this danger; the question as to whether such omission amounted to negligence being left entirely to the jury.

A rule of the company requiring its motormen to keep their cars under full control on approaching all street crossings, and, when there is a car standing at a crossing, taking on or letting off passengers, or if they see that they are about to meet a car on a street crossing, to slow up and see that the track is clear before attempting to pass, the court also holds, is admissible in evidence, as tending to show that the company regarded such a point on its line, when being approached by one of its cars, as more or less dangerous to passengers and others.

On the other hand, it holds that where it appeared from the testimony that the hearing of the passenger suing the company was impaired, and it was inferable that for this reason he did not hear the approaching car that struck him, it was not error for the trial judge to instruct the jury that "the fact that he was partially deaf, if such was the fact, would not affect or lessen the degree of care required of him; that care being the degree of care which every prudent man would exercise under the same or similar circumstances," which would not imply that he was required to exercise only that care which a prudent man who could hear would use, but which a prudent man in the same condition as to the impairment of his hearing would exercise.

Judgment for \$1,000 and costs, against the company, affirmed.

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#### Adoption of Box System of Collecting Fares a Proper Safeguard.

*Morley v. Snow (Mich.), 75 N. W. Rep., 466. May 24, 1898.*

The receivers of the Union Street Railway Company of Saginaw, Mich., have been granted, by the supreme court of Michigan, a mandamus requiring the circuit judge to va-



cate an order requiring the discontinuance of the use of the Mehling box system of collecting car fares from passengers.

This box is a metal safe, of convenient size, carried by the conductor, into which the passenger is required to deposit his fare, at which time the conductor presses a button which rings a bell and registers the fare. At the end of the day the box, with the transfer tickets, is handed by the conductor into the office, and becomes his settlement with the company.

To one conductor, it was so distasteful to use the box, that he applied to the circuit court for relief, not only upon the ground that it reflected upon his character, but that it gave rise to controversies with passengers and was objected to by them, as well as that it was beyond the power of receivers to require. And the circuit court granted his prayer, maintaining that to require the use of the box was not a proper regulation, as it was not a thing to be used in the manner in which it was used, and that its use tended to ostracize from society the employes who had to use it, by branding them as not to be trusted.

But the supreme court thinks that the conclusion reached by the circuit judge was wholly unwarranted by the facts. It says that conductors of street cars deal with a great number of persons, some of whom are entering and leaving the cars frequently. It often happens that change must be made, and there are opportunities for mistakes. It is not unreasonable to assume that, like persons in all callings, some of the employes of street car companies will yield to temptation, when presented. Every one at all familiar with business upon a large scale knows that it is desirable to have it so systematized that mistakes or fraud in its conduct shall not occur. Officials, both of the state and nation, and all officers charged with the management of banks, railroads, and other corporations, are surrounded by checks and safeguards calculated to do away with the possibilities of frauds or mistakes. The cash register is to be found in most places of business. Upon the elevated roads, in the large cities, the passenger pays his fare before he enters upon the platform, over which he must pass to get admission to his train. Every one recognizes the checks and safeguards, as proper to be used, and no one has a right to regard them as an imputation upon the honesty of any individual using them. Their use is simply a recognition of what all know to be a fact, with humanity constituted as it is—that, in the conduct of a large business by many persons, there is a liability to make mistakes, and a possibility of the commission of frauds. The Great Teacher, in that prayer which is the model of all prayers, prayed, "Lead us not into temptation, but deliver us from evil." It can readily be seen how the unintelligent or dishonest might object to these checks and safeguards, but it is difficult to understand how the honest and intelligent should object to any practical method which would reduce the probability of mistakes, or the opportunities for the commission of fraud, to the minimum.

The supreme court also holds that an active receiver, who is required to manage a going concern like a system of street railways or a railroad, must be clothed with considerable discretion, and that he may do such things, in the ordinary course of business, as to him, in good faith, seem necessary to render the business of the road profitable and successful. He is not only the arm of the court, but he represents, in a sense, the creditors and the stockholders of the road. Nor does it consider that but very few courts, if they

had the time to do so, possess the necessary knowledge to enable them to successfully manage a system of street railways.

Applying these principles to the case in hand, the supreme court holds that the receivers in question had acted only within the scope of their authority, on a point with regard to which the court should not interfere, and that if they were not competent to deal with such a detail, they should be removed, and some one competent appointed.

### REWINDING RAILWAY GENERATOR ARMATURES.

The illustration was taken from a photograph of the interior of the Cedar avenue power station of the Cleveland Electric Railway Company. The armature is from a 500-k. w. generator and was being rewound by the W. H. Elliott Electric Company, this being the third one repaired for the same company this year. Exceptional facilities are pos-



500-K. W. RAILWAY GENERATOR ARMATURE REWOUND.

sessed by this company for doing general repair and heavy electrical work. A specialty is made of rewinding armatures, fields and transformers, refilling and making commutators and building apparatus for experimental work. The president, Mr. Cartwright, was the pioneer in this line of work, having established a repair shop for electrical apparatus in Cleveland in June, 1887. The secretary and treasurer, Mr. Haukey, has charge of the chemical department, and although a new man in the electrical field is rapidly extending his acquaintance. The business of the company is very extensive, orders coming from every part of the country. Two large armatures have been shipped to the Salem Consolidated Company, Salem, Ore.; an order from Jacksonville, Fla., has been filled, and an armature has been shipped to the New York & Ohio Company, Warren, O. The works are now operated by both day and night shifts and it will require six weeks to fill the orders on hand.

## AN IMPROVED ELEVATED CAR TRUCK.

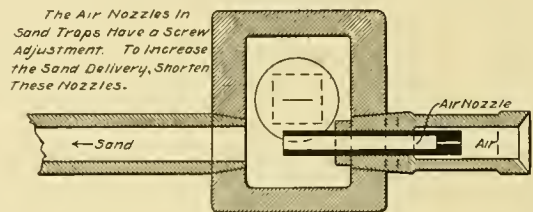
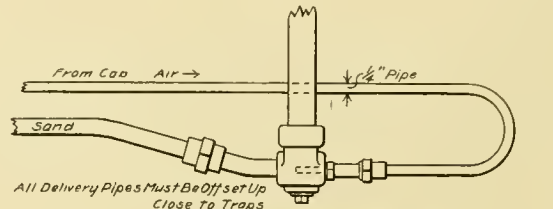
The adoption of heavier motors under the cars of the Lake Street Elevated Railway Company, of Chicago, necessitated alterations in the trucks or the substitution of a new one. Frank Hedley, general superintendent, has given the subject his attention for some time and has designed a new truck and brake rigging. The trucks were built at the works of the Siemens & Halske Company and have given entire satisfaction in operation.

The frame is of cast-steel. The transom, which consists of two pieces of steel plate, is riveted to the frame. Four 21-in. links support the swing bolster and their length gives the car an easy motion. The tie-bar at the end is bent downward to give room for the draw-bar. Each wheel has to sustain about 7,000 lbs. The boxes are designed to carry two helical springs which give great flexibility and easy motion to the car body. The wheels are 33 in. in diameter and the wheel base is 6 ft. The truck is not only simple in construction and accessible but a large amount of room is provided for the motors. This is an essential feature for the two G. E. 55 motors, each of 175 h. p., require all the space. The motor casing clears the ties by 3 in.

For this truck it was desirable that the brake rigging have no cross bars, for they would interfere with the repair and inspection of the motors, and prevent an equal pressure being exerted by each brake shoe. One-half of the brake is hung independently on each side of the truck, a bracket being riveted on the frame in front of each wheel and the brake shoe is suspended by a link, as may be seen in the illustrations. The two levers are connected by two

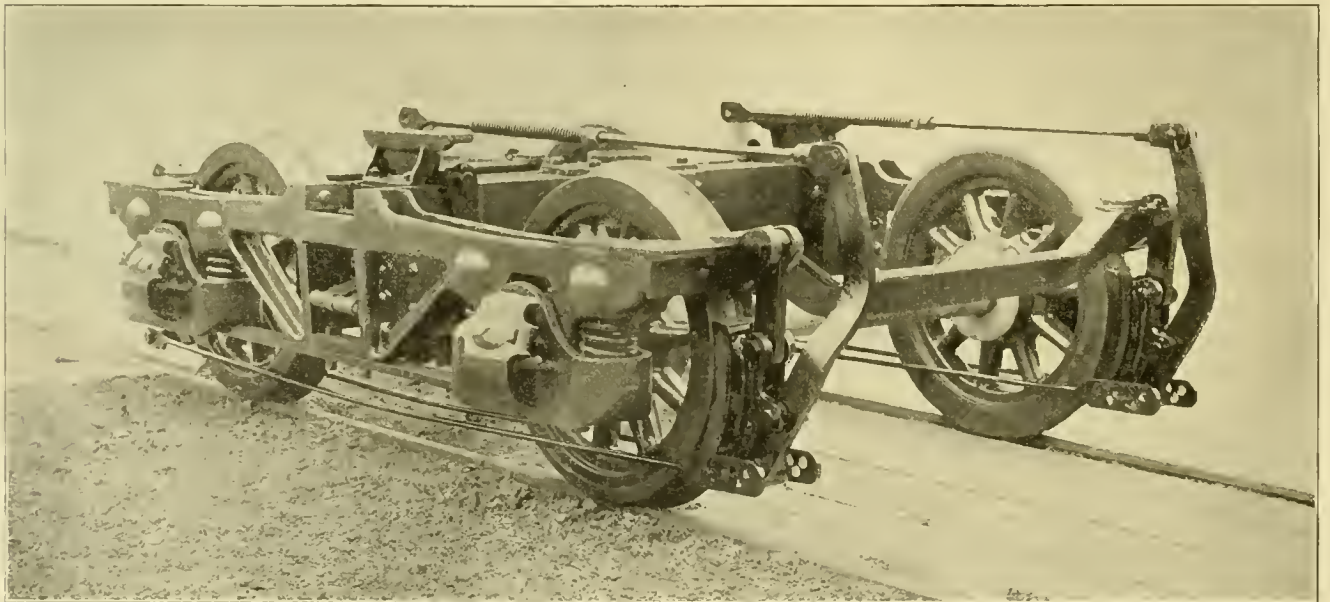
adopted as standard on the Lake Street Elevated cars, as it has been proven to be suited in every way to the arduous service and requires practically no attention.

Each motor car has but one driving truck, and so the entire tractive effort for the whole train comes from one truck. If the rails are clean and dry no trouble is experi-



LEACH SANDER.

enced from the wheels slipping, but with snow or ice on the track or on a damp day the use of sand would be an advantage. One of the motor cars has been equipped with a sanding device and tested. A sand box is placed over the driving truck and four pipes lead down from it beneath the



TRUCK AND BRAKE FOR LAKE STREET ELEVATED RAILWAY.

rods, one on either side of the wheel. The outer end of each of these rods is flat and has the holes for adjusting the brake shoes as they wear.

The kick spring is long and flexible and offers little resistance to the action of the air brake, but is strong enough to quickly release the shoes. This brake rigging has been

car body. At the end of each pipe is a Leach sander, such as is commonly employed on locomotives, and shown in the cut.

A pipe is connected to the air brake system near the engineer's valve in the motorman's cab and extends to each of the sanders. From the sanders four 1/2-in. pipes run to



the pivot of the truck and each is connected to a pipe, which delivers sand to the wheels, by a hose 14 in. long, which allows for the motion of the truck and car body.

When sand is to be used the motorman opens an alarm valve and the air passes to the sander, where the film of sand is broken and then blown into the delivery pipe. It acts on the same principle as an injector. The pipe in front of the sander has an upward turn which prevents the sand from clogging at that point. The sand passes out of the delivery pipe and is blown directly on the rails under the wheels.

The results in using sand have been gratifying. Without the sand a train of cars was accelerated to a speed of 24 miles an hour in 32 seconds. Under the same conditions with the use of the sand the same speed was attained in 16 seconds.

### JOHN'S ELECTRIC HEATERS.

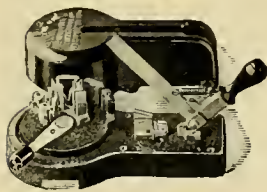
Some recent improvements have been made in the "H. W. J." electric heaters. These heaters have been on the market for a number of years and are at the present time extensively used by street railway companies, both here and



PANEL HEATER.

abroad. The illustrations show the panel heater and the switch in their latest forms. The principal advantage claimed for these heaters is that they have a very large radiating surface for the heat generated and hence avoid very hot or overheated wires or surfaces and dangerous temperatures. All the heaters are in operation at the same time and give a very effective and economical distribution of the heat.

The heaters are attached to the faces of the seat panels by screws and special separating washers of waterproof asbestos are furnished to provide an open ventilating space  $\frac{3}{8}$ -in. wide between the panel face and back of heater. Connections are readily made with the heater terminals by leading wires through small holes bored in the panels and all wiring is concealed back of the panels under the seats. No cutting of the woodwork is necessary.



SWITCH.

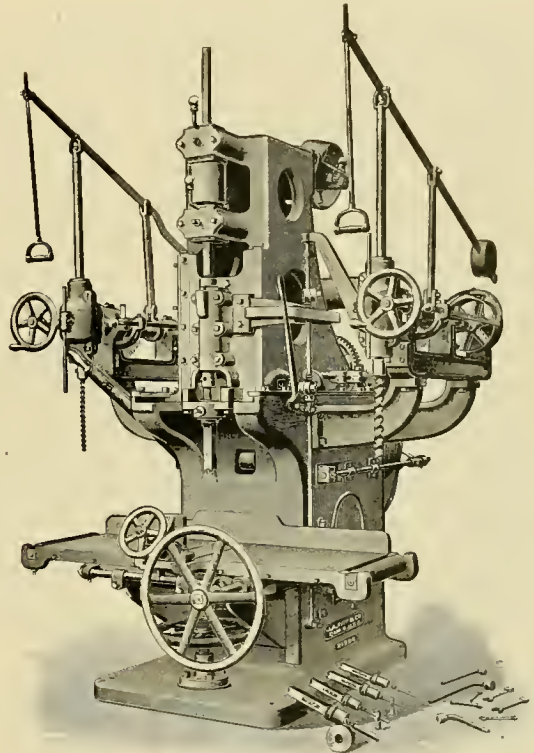
The "H. W. J." switch provides three degrees of regulation. It is a double break knife switch specially designed with reference to simplicity, high insulation and durability. Its action is positive in all cases. Closing the knife blade locks the switch in position preventing any movement of the regulating handle. The regulation in the "H. W. J." system is effected by reducing the heating surface equally in all heaters.

The Baltimore Consolidated Railway Company has purchased the uncompleted line to Ellicott City from the Columbia & Maryland Company.

### NEW HOLLOW-CHISEL MORTISING MACHINE.

The accompanying illustration shows one of the most powerful and reliable machines of its kind ever placed upon the market. It is made by J. A. Fay & Co., of Cincinnati, and known as their No. 4 vertical hollow-chisel car mortising machine. Great care has been exercised in the design to make a machine strong, simple and efficient, and one that produces its results without the necessity of laying out the work or cleaning the mortises.

The frame is massive and made in a cored form with a wide base. The housing is gibbed to the frame, with provision for taking up wear, and has a lateral movement, actuated by a lever, for moving the chisel to its required position.



FAY HOLLOW-CHISEL MORTISING MACHINE.

above the timber. The chisel-ram is gibbed to the housing and carries the boring spindle that prepares the material for the chisel thrust; the proper tension is kept on the belt driving the boring spindle by a self-adjusting binder. Stops are provided to regulate the vertical travel of the ram for the depth of mortise and the lateral movement for its width; the maximum vertical movement is 16 in. and the lateral, 14 in.

The table for supporting the material is 4 ft. 6 in. long; it is operated by a hand wheel, rack and pinion, and provided with stops to regulate the length of the mortise; there is also a vertical adjustment. The chisel-ram has a reciprocating motion produced by reversing friction and gearing. The auxiliary boring attachments are placed one on each side of the frame at such distances from the chisel as will permit of adjusting them to an angle of  $30^\circ$  in either direction.

The Milwaukee-Waukesha line is now in operation on a half-hour headway; the fare is 35 cents, round trip 50 cents.

## PARK SCENES FROM ALABAMA.

In the article on street railway parks and pleasure resorts in the REVIEW for May mention was made of the attractive parks of the Birmingham (Ala.) Railway & Electric Company. J. B. McClary, general manager of the company, has very kindly sent to the editor of the REVIEW three large and handsomely framed groups of photographs which now adorn our offices, showing scenes along the lines of the company and at the parks. With them Mr. McClary sent the following letter:

"You have done a great work for the street railways by encouraging them to build parks and run summer theaters.

## QUICK CONSTRUCTION WORK.

On June 13, Judge Ball in the superior court refused to enjoin the Chicago City Railway from stringing temporary trolley wires in Michigan avenue from Madison street to Randolph street, this being the final outcome of the suit instituted by Montgomery Ward.

The fact was telephoned to the offices of the company at 2020 State street, and within 1 hour and 30 minutes from the time the message reached Superintendent Nagle the electric cars were operating around the loop thus completed. The work done comprised the placing of wires for the two blocks in Michigan avenue and at the two curves.



SCENES IN THE PARKS OF THE BIRMINGHAM RAILWAY & ELECTRIC COMPANY.

We have profited by your suggestions and desire to show our appreciation, in a measure, by presenting you with a lot of views of our parks, framed, suitable for your office. If you will honor these pictures with space on your walls the writer will be highly gratified."

The accompanying engraving is reproduced from one of the groups. Four of the views were taken in Avondale Park, the terminus of the Avondale & Fountain Heights electric line; three others show scenes at Hawkins Spring on the Bessemer division; the last two pictures are of the dancing pavilion and the lake at East Lake Park.

## CONNECTICUT GRADE CROSSING CASE.

The supreme court of Connecticut on June 17 rendered its decision in the case of the New York, New Haven & Hartford Railroad against the Fairhaven & Westville Railroad (electric) which sought to cross the former at grade. The court allows the claim of the steam road for damages for crossing its tracks at grade, and the case is distinguished from that decided a year or more ago in which it was held that an electric railway in general is not an additional burden on abutting property.



### IMPORTANT MEETING OF COMMITTEE ON STANDARDIZATION.

The permanent committee on a standard system of accounts, working under the Street Railway Accountants' Association of America, and which is doing a large amount of hard work in anticipation of the September convention in Boston, has been called to meet at the Manhattan Beach hotel, New York, on July 18. In addition to Chairman C. N. Duffy, the committee includes W. F. Ham, Brooklyn; J. F. Calderwood, Minneapolis; H. L. Wilson, Boston; H. J. Davies, Cleveland; W. B. Brockway, secretary of the association, will also attend. A full attendance is promised and a thorough consideration will be given to the data collected by the several members.

The railroad commissioners of the various states also have an association, and at its meeting last year appointed the following committee to prepare a proper classification of constructing and operating expenses of street railways, similar, so far as possible to the classification of the same accounts of steam railroads. This committee consists of the following: Wm. O. Seymour, railroad commissioner of Connecticut; Ashley W. Cole, Albany; R. S. Cauler, Columbus, O.; H. M. Kochersperger, president railway accounting association, New Haven; M. Riebenach, assistant comptroller Pennsylvania Railroad, Philadelphia; H. D. Bulkley, comptroller B. & O., Baltimore, and N. H. Heft, N. Y., N. H. & H. R. R., New Haven

The Accountants' committee has invited the railroad commissioners' committee to meet with them, and the invitation has been most courteously received and several of the gentlemen have signified their intention to be present, and their satisfaction at the opportunity of this joint conference with men prominent in the active and actual work of street railway accounting. The suggestions from both sides and the joint conference cannot fail to be of very great advantage to every street railway in states where the commission has to do with both steam and street railways

The interest taken by the commissioners' committee in the work of the Street Railway Accountants' Association and especially in the work of the Committee on Standardization, is very gratifying, and the gentlemen pronounce the progress already made and the plans which are being worked out, as highly creditable and praiseworthy.

The meeting will be called to order promptly at 9 a. m. Monday, by Chairman Duffy and the work will probably occupy several days.

### SHOOTING THE RAPIDS.

So far as exciting attractions are concerned, it is probable that the Gorge Road at Niagara Falls has the call on all the electric roads in the country. Its route lies along the wildest part of the lower Niagara and the very nature of the locality tempts the daring of people. Those who like excitement can find it there in plenty. Within the past month Mr. Evans, of the Youngstown & Lewiston road, has attempted to establish a canoe route between the Devil's Hole on the Gorge Road and the quaint old village of Lewiston, the terminus of the two roads mentioned. In order to get expert men at the paddles, Mr. Evans secured the services of Chief Flying Cloud and Chief Cherry, and the picture herewith shows them in the act of shooting the rapids below the Devil's Hole in their canoe. These Indians came

from Sault Ste. Marie, where they had had extended experience. At this writing the route has not proved to be one of any great attraction for Niagara tourists, but as it is very new as yet, it will have time to grow on the people. That part of the river below the Devil's Hole is quite wild in places, and the waves toss high, while the many currents add to the excitement and weirdness of sweeping through the gorge in a canoe.

Still another incident that has drawn travel to the Gorge Road during the past month was the two trips that Robert Leach made through the rapids in a barrel. On Leach's first trip he used a wooden barrel, and this time he was taken



SHOOTING THE RAPIDS.

from the water in an eddy just above the whirlpool on the Canadian side. His barrel was lost after he had landed. During the week he had a barrel constructed of steel, and on the Sunday following his first trip he again started out to conquer the wild waters of the gorge. This trip was a great success. He was soon hurried through the rapids to the whirlpool, his barrel standing the waves nobly. He passed four times around the current in the pool, and was finally towed ashore on the north side and on the Canadian shore by four men who swam out to the barrel. Leach was in good condition. He had stood the trip well. His barrel had wooden heads, and was well ballasted. In making the trip he was swung in a hammock on the inside. The length of this barrel is 7 ft. Its diameter at the ends is 3 ft. 6 in., and in the center 3 ft. 9 in. The steel of which it is made is 3-16 in. thick. His first trip through the rapids was made June 12 and the second on June 19.

### REORGANIZATION OF THE NASSAU COMPANY.

All the Brooklyn street railway companies, whose lines were leased by Nassau Electric Railroad Company, have been consolidated and the reorganization will result in a saving of \$200,000 a year. Application has been made to the state railroad commission for permission to increase the capital stock to \$15,000,000, a million and a half of which will be reserved for improvements in the eastern districts.

## STORAGE BATTERY RAILROADING.

BY E. R. GILBERT, GENERAL MANAGER CHICAGO ELECTRIC TRACTION COMPANY.

The storage battery plant and equipment of the Chicago Electric Traction Company, or as it was formerly, and perhaps better known, the Englewood & Chicago Electric Street Railway Company, has been fully described in the REVIEW and in this article it will not be my intention to describe it again in technical detail, but rather to touch upon its advantages and disadvantages in comparison with street railways using other systems of propulsion. It is now the only storage battery road in successful operation in the United States, and, on that account, my experience as its manager will doubtless be of interest to street railway men.

The road was designed and constructed by G. Herbert Condict, to whom the largest part of its mechanical success is due; but as is usual in all new developments, experience brings to light many points for improvement. Some changes have already been made and others are in contemplation, which will undoubtedly reduce the operating expenses per car-mile below the figures given in this article. Moreover, the plant was designed for the operation of 50 cars but for commercial reasons it is found advisable to run but eight regular cars on week days, although on Sundays and holidays as many as 40 are used, including trailers, so that it is not operating at its maximum efficiency.

Owing to the weight of the cars, which is about 15 tons, they cannot be started and stopped as quickly as a trolley car which weighs but eight or nine tons, and at first thought it would seem that the liability to accidents (the "bugaboo" of all managers) would be increased. My experience shows however, that this is not the case for the last year our accident account is only two-thirds of one per cent of the gross receipts. This is extremely low, the usual rate for a suburban trolley line being about 2 per cent. I account for this rather surprising figure on the theory that, as the motormen are fully aware of their inability to stop quickly, they are more on their guard to avoid accidents, always passing vehicles with the power shut off, giving them a better opportunity to use the brakes. The weight of the cars shows to good advantage on account of their being able to coast faster and farther than would otherwise be the case.

In connection with this point, we have found that an entirely different training is necessary for a storage battery motorman than for one who operates a trolley car, and we prefer to break in green men rather than employ those who have been used to an overhead system. The principal point we have to drill into them is to coast as much as possible. As a record of the condition of each battery is kept when it leaves the barn and when it returns, an accurate report can be made out of the amount of energy each motorman has used on his trip and such a report is posted every day in the trainmen's room, with the best man at the top of the list. This system excites considerable rivalry in the men and produces excellent results.

Contrary to all expectations, we met with excellent success in handling snow storms last winter. We have but one plow and one sweeper for 26 miles of track, but not in a single instance were we unable to have our road clear before the other suburban lines got through. Until we had a little

experience with out snow machines, we had some trouble, as we could only tell by trying, how much work they were capable of doing with one charging of the batteries, and therefore had one two "push-ins," as we call them, but after the men became accustomed to their use, they were able to get more work out of them than I have ever seen accomplished with machines operated by trolley. On account of their great weight—the plow weighing 22 and the sweeper 26 tons—there is little danger of their leaving the track, so that it is safe to "buck" drifts with the plow, a thing which is rather risky with a lighter machine. In one case, we cut through a drift 7 ft. high and several hundred feet long in this way.

Our longest round trip is 22 miles. With a good rail, this is easily accomplished without a change of batteries; in fact, we have had cars run as far as 40 miles with one charge, but the conditions for such a long run are so often unfavorable that it has been found advisable to change batteries every half trip or 11 miles, the power plant being located in the center of the system. By doing this all danger of a "push-in" is avoided and the cars are able to carry trailers and make the trip under all conditions. Passengers do not seem to mind in the least, the slight delay caused by changing batteries. The average length of time required for changing is 1¼ minutes.

It is a popular belief that a storage battery car cannot operate successfully on grades. This may be true if they are frequent and steep. Our roadbed is nearly level the entire length of the system with the exception of one hill about 300 ft. long with a grade of 9½ per cent. The cars easily climb this without assistance, with a dry rail. In one instance, two loaded trailers were hauled but in order to prevent the danger of accidents and slipping, a counterweight system is provided. It is found to be unnecessary to use this except with a slippery rail. I hope to be able to cut this grade down to about 7 per cent. Then the counterweight will become superfluous.

Our cars average over 200 miles per day each, at an average speed of 12 miles per hour. Passengers, one and all, agree that riding on them is much more pleasant than on any other system, as the cars ride very smoothly, owing to their weight without the unpleasant noise of the trolley or the jerking of the cable system. The advertising resulting from these conditions is worth considering.

An element of importance is the fact that the whole line cannot be shut down at once, as all cars are independent of each other. There is no necessity for a wrecking wagon, as a wrecking car can always be sent out, as on a steam road. The steam plant is also more independent than on a trolley road, as it can be shut down two or three hours without interfering with the service in the least. Current for lights in the office, barn, and power house is taken direct from the batteries; therefore, there is no necessity to run the plant all night. It is closed down at 11 p. m., although the last car does not reach the barn until nearly 1:30 a. m. The load on the engines and dynamos is always constant.

I now come to the points of disadvantage. On account of the fact that every car must come to the barn for a fresh battery after every few miles of travel, branch lines cannot be operated economically. On this road we have a branch line which could be operated with one-half the number of cars if they did not have to come to the barn after every trip. If the branch were large enough to warrant the expense a subcharging station could be put in, but it is not in this case.



E. R. Gilbert, general manager of the Chicago Electric Traction Company, has been identified almost continuously with street railway operations ever since he started in practical work. He was



E. R. GILBERT.

born and received his education in Hartford, Conn., leaving there to work in the factory of the Eddy Electric Manufacturing Company at Windsor. Starting at the bottom of the ladder as a shop hand he finally became manager of the Boston office before he left the employ of the company. The Hartford Street Railway Company secured his services as purchasing agent and from there he went to Philadelphia to take up the duties of general manager of the Holmesburg, Tacony & Frankford Electric Street Railway Company. Thus far his experience had been with trolley roads, but when Mr. Condit resigned as manager of the Englewood & Chicago Electric Railway Company, Mr. Gilbert was called to Chicago to fill the place. Under his management the road has had a period of prosperity such as it has never experienced before.

Wear and tear on trucks, wheels, roadbed and special work is very much heavier than on a trolley system because of the great weight of the cars. We use an 80-lb. girder rail and all crossings, etc., are made extra heavy, but even then the cost of maintenance is very great.

Acid fumes from charging batteries is one of our greatest enemies. The barn is so arranged that the cars stand directly over the batteries. This is so that any car may be "loaded" while in the barn. The fumes have a most damaging effect upon nearly all material. Insulation is continually eaten off the cables; brass work corrodes faster than it can be cleaned; car curtains have to be renewed every year; paint and varnish do not last long, and even the woodwork itself shows signs of being affected. This could all be avoided by storing cars in a building separate from the batteries; but of course the advantage of being able to put in batteries in the barn, would then be lost and much time consumed in moving cars about by pushing and pulling them with a motor car.

A few figures from our records for the year ending July 1, 1898, will perhaps be of interest. In obtaining figures on trolley systems for comparison, I have taken advice from several trolley managers to whom I am indebted, and have also used figures which I obtained myself when in charge of a trolley road similar in length and car service to this one.

The depreciation of the batteries is 2 cents per car-mile. The depreciation of the batteries takes the place of the depreciation of overhead work and railbonding on a trolley road. This latter item on a road similar in length to this one would amount to about \$4,325 per year.

The men required to operate the batteries take the place of a line gang. Our total operating expenses average 8 2-3 cents per car-mile, ranging from 7 cents in summer to 10 cents during the most severe winter weather.

Operating expenses will undoubtedly be cut down as the service required grows toward the capacity for which the plant was built, and compares very favorably even now, with those of a trolley system. I see no reason why a storage

battery system under fair conditions cannot be operated fully as cheaply as a trolley line.

In reference to first cost, the storage batteries and their equipment together with the extra heavy roadbed are matched against the overhead construction and railbonding. Figuring on a basis of \$4,750 per mile for line construction and railbonding, the difference in cost on this particular road would be only about \$25,000 in favor of the trolley system. This estimate is made on a service of 20 cars, with the same length of line that we now have.

To offset the slightly greater expense in the construction of a storage battery road, is the unquestionable advantage of having no overhead work of any kind to mar the appearance of the streets through which the road runs.

## A WELDED RAIL BOND.

The bond shown in the illustration is manufactured by the Payne Welded Bond Company, of New York, and has a number of characteristics which strongly recommend it. Being welded to the rails there is excellent mechanical and electrical contact and it can be placed on the web under the fish plate, the base or below the head of the rail. The bond has been subjected to careful tests and demonstrated that there is practically no drop through the contracts.

The bond was also tested in connection with one of the best known mechanically attached bonds; 750 amperes were passed through the rails in each case, and the loss in volts read at the joints by the voltmeter as follows:

Mechanical bond, No. 0000 wire,	loss .....	.090 volts.
Two feet of rail .....		.006 volts.
Welded bond and two feet of rail .....		.014 volts.
Welded bond .....		.008 volts.

Although the Payne bond contained but 8 oz. of copper to 38 oz. in the mechanical bond the former had but 8.8 per cent of the resistance of the latter. The Payne bond has also passed satisfactorily through the test of service, having been used for two years on the 100 miles of trolley road of the Brooklyn Heights Railroad Company, on the Brooklyn, Queens County & Suburban Railroad and on the Brooklyn Bridge. The bond in use in Brooklyn consists of 10 pieces of No. 34 copper, 2x5 in. with a contact area of 1x2 in.

Judge Holcomb, of the circuit court of the United States for the eastern district of New York, in a suit brought by the Paynes for infringement, upheld the patents, and a decree was entered to that effect, so that the company's patents are well established.

## A PROPOSED MAINE INTERURBAN.

A corporation has been formed to construct an electric road from Fairfield to Benton Falls, Me. Freight as well as passenger business will be conducted as there is a large pulp mill at Benton Falls without railroad connection. Freight cars will be hauled direct from the Maine Central Railroad to the mill. J. T. Richards, of Gardiner, and C. D. Brown, of Portland, and others are interested.

## SOME PHASES OF THE RAPID TRANSIT PROBLEM.

Read before the American Institute of Electrical Engineers by Albert H. Armstrong, June 28, 1895.

The rapid transit problem, in congested districts, has to deal with the transportation of passengers at a high average speed with frequent stops, and even in suburban traffic where the stops are less frequent, the schedule speeds have been so increased by the ability of the electric motor to accelerate rapidly, that trains hardly reach full speed before it is necessary to apply the brakes. As running at a constant speed does not occur in rapid transit service where stops are at all frequent, it becomes of the greatest importance to carefully investigate the subject of train acceleration in order to determine the method of running a train from station to station with the least expenditure of energy.

Problems in train acceleration may be divided into two broad classes: 1.—Where the road is level and

2.—Where grades exist or where an artificial profile is made in order to take advantage of down grades at starting.

Modern passenger cars demand a dead weight of approximately 550 lbs. for each passenger carried, or, in other words, only 20 per cent of the total weight of a loaded motor car is a paying load. When it is considered that in rapid transit service with frequent stops, over 80 per cent of the total energy output of the motive power on level roads is required to accelerate the train, it is evident that in this class of service the rolling stock requires the greatest attention.

To avoid undue complication, the following discussion has assumed that train friction is a constant quantity at all speeds, as at the low maximum speeds—20 to 30 miles per hour—reached in practice with frequent stops of two or more per mile, the error introduced by assuming a constant friction rate will be small and will not at all alter the conclusions arrived at.

The following constants have been assumed as representing average operating conditions:

Length of run, 2,000 ft.

Length of time train is in motion, 75 seconds.

Schedule speed, 16.65 miles per hour, including 10-second stops, or 85 seconds total time.

Traction effort, 100 lbs. per ton total, to be maintained uniform during acceleration of the train.

Braking effort, 150 lbs. per ton constant throughout the period of braking.

The train friction being 15 lbs. per ton, reduces the effective accelerating force from 100 to 85 lbs. per ton, corresponding to a rate of .927 miles per hour per second.

With this data a simple acceleration curve, as in Fig. 1, may be calculated, the train reaching a maximum speed of 28 miles per hour in 30 seconds, when power is shut off and the train allowed to coast with a retardation due to friction of .1635 miles per hour per second for 31 seconds to the braking line, when it is retarded at a uniform rate of 1.635 miles per hour per second and comes to rest in 75 seconds from time of starting.

Owing to the greater efficiency of the run, the train is allowed to coast after reaching its maximum speed rather than to allow it to continue at a uniform speed with just sufficient power supplied to overcome the train friction loss.

It is obvious that the train could be accelerated at a different rate than that corresponding to 70 lbs. per ton and still make the same length of run in the same time, the length of time occupied in coasting depending upon the rate of acceleration, being a maximum with an infinite rate, that is, with the train starting with a certain initial velocity. A minimum rate of acceleration is reached when no time is left for coasting, that is, when brakes are applied as soon as power is shut off.

In Fig. 2 such a set of curves has been prepared showing a train covering a distance of 2000 ft. in 75 seconds, as before, but accelerating at various rates from that corresponding to 62.8 lbs. per ton as a minimum up to an infinite rate, or starting with an initial velocity of 25.2 miles per hour.

As the area enclosed by time as abscissa and speed as ordinates represents the distance covered, this will be a constant quantity for the fixed distance of 2000 ft. assumed, and curves

of Fig. 2 are thus constructed with the same enclosed area for each rate of acceleration. The fact is plainly brought out that with a low rate of acceleration a much higher maximum speed is demanded than would be the case if the rate had been increased, and a curve may be plotted by joining the maximum speeds reached for different accelerating rates, as shown.

A friction of 15 lbs. per ton has been chosen as being that of an average train composed of a motor car and three or four trailers and weighing about 120 tons. With heavier and longer trains this rate may be reduced to as low as 7 or 8 lbs. per ton, while for a motor car alone, the rate may be as high as 30 lbs. per ton, due to friction of motors and gearing. The braking effort of 150 lbs. per ton is also chosen as representing what can be done on an average by a train equipped with air brakes and operating at half the slipping coefficient of the wheels.

It is advisable in rapid transit service to keep the maximum speed reached by the trains as low as possible, as this class of work generally calls for a short time-interval between trains where the utmost precautions are necessary to keep the trains a safe distance apart. In fact, the maximum speed required for a given run practically determines the time-interval between trains, as the train headway should be at least five or six times the length of time required to bring a train to rest from its maximum speed with normal braking force applied.

A second reason for higher rates of acceleration lies in the fact that with rates of acceleration approaching the minimum no margin is left for errors of judgment of the motorman, as little or no time is left for coasting, and the rate of acceleration per ampere input is continually varying with the changing passenger load and hence with an overload it becomes difficult to maintain schedule speed.

A third and most important objection to the use of a low rate of acceleration lies in the saving of energy for the run by the use of a higher rate.

Neglecting  $I^2 R$  and core losses of the motors, a set of energy input curves per ton weight of train may be plotted as in Fig. 2, assuming for simplicity that motors are series wound, operate all in multiple and are so geared that starting resistance is entirely cut out at the various maximum speeds reached in the various runs, that is, that no accelerating is done on the motor curve. A constant impressed e. m. f. is assumed, and starting resistance is supposed to be cut out proportional to the motor speed, thereby keeping the current and torque constant.

Thus it is seen that accelerating a train with the minimum rate calls for the highest maximum speed, demands nearly the least current input and also demands the greatest waste of energy in the brakes, as the speed is a maximum when brakes are applied.

The areas enclosed by the various energy time curves represent the comparative amounts of energy required for the run for the different rates of acceleration and these are plotted in Fig. 2, which compares the energy input and the average energy consumption for the run of 2,000 ft. in 75 seconds for all rates of acceleration from the minimum corresponding to 62.8 lbs. per ton up to infinity.

For convenience the average energy rates are plotted in terms of watt-hours, and the curve shows that while the minimum rate of acceleration corresponding to 62.8 lbs. per ton calls for an expenditure of 83.5 watt-hours per ton weight of train, this is reduced to 56.5 watt-hours by accelerating with a rate corresponding to 70 lbs. per ton, to 42.7 watt-hours with 100 lbs., and finally reaches a minimum value of 32.5 watt hours if the accelerating rate is pushed to infinity.

Thus the energy required for the run of 2,000 ft. in 75 seconds may vary from 83.5 to 32.5 watt-hours per ton of train weight, a decrease of over 60 per cent, depending upon the rate of acceleration used.

The curves in Fig. 2 are worthy of careful study, and similar curves afford a means of determining the proper rate of acceleration and hence motor equipment, gearing, etc., to use for a given set of conditions. The limiting factor in the more rapid rate of acceleration of a train is the current input required. Thus, if the rate of acceleration be carried to abnormally high values, the local demand for current becomes so great that either the loss in the feeders more than offsets the reduction in energy consumption at the train, or else the interest on the increased feeder investment is not offset by this energy reduction.



There are other limiting factors governing the rate of acceleration in the size and weight of motors, which are limited in the current they can carry without undue sparking and heating. Thus it will be found that the rate at which a train accelerates, largely determines the cost of feeders, size of motors and generators, both in regard to current and thermal capacity, and also fixes the safe headway between trains.

The error made in accelerating at or near the minimum rate is clearly brought out. For example, the current consumption per ton is the same for 62.8 lbs. per ton or 85 lbs. per ton; as, although 85 lbs. calls for the greater tractive effort, the torque per ampere is so increased by the lesser maximum speed demanded that the current input is the same in each case, hence the feeder considerations are the same in both cases, while the energy consumption shows a reduction from 83.5 watt-hours per ton with 62.8 lbs. to 47.5 watt-hours, or about half, with 85 lbs. per ton.

Referring again to Fig. 2, it is obvious that a similar set of curves may be plotted for a run of 2,000 ft. for any other length of time than 75 seconds, and Fig. 3 gives such a set of curves plotted for lengths of time ranging from 41 seconds, as a minimum possible, up to 210 seconds. The minimum time in which

with no coasting, is thus the curve of maximum input for a run of 2,000 ft. for any length of time. Also the curve c-d, being the locus of the various coasting lines, that is, of no braking effort, is thus the curve representing the minimum possible input.

To compare the amounts of energy required for rates of acceleration other than the maximum and minimum, a set of curves has been prepared in Fig. 4 giving the energy consumption for a run of 2,000 ft. on a level track for any rate of acceleration and for any length of running time, the constants being 15 lbs. per ton friction rate and 150 lbs. per ton braking effort. For convenience in comparison, the energy of consumption is reduced to watt-hours per-ton mile, and speed is expressed as average speed in miles per hour while train is in motion or equaling schedule speed if the train loses no time in stopping. The dotted curve A-B is the maximum energy curve corresponding to the curve A-B of minimum rates of acceleration in Fig. 3, and the curve c-D represents the minimum amount of energy possible for the different speeds and is described by an infinite rate of acceleration.

The curves of maximum and minimum energy consumption approach each other and coincide at a speed of 33.3 miles per hour,

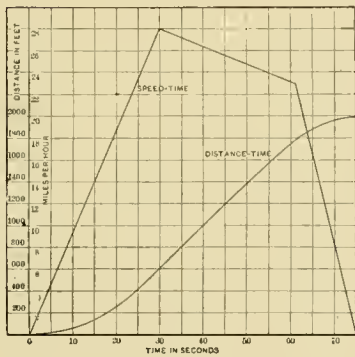


FIG. 1.—ACCELERATION CURVES.

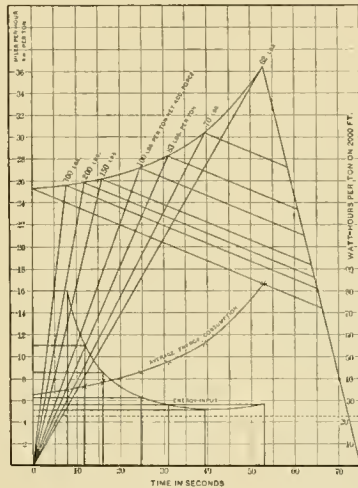


FIG. 2.—SPEED AND ENERGY CURVES.

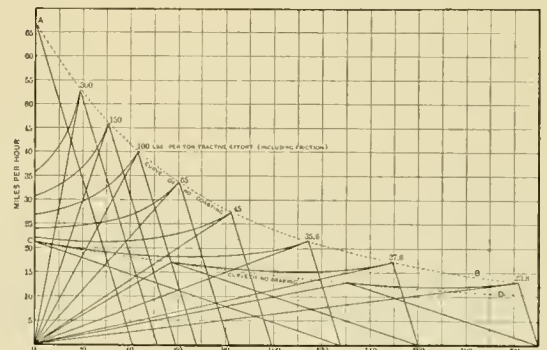


FIG. 3.—SPEED CURVES.

it is possible to make a run of given length is determined by the braking effort, in this case assumed to be 150 lbs. per ton, the train reaching a maximum speed of 66.5 miles per hour in zero seconds with an infinite accelerating force and being retarded throughout the entire running time of 41 seconds at the rate of 1,635 miles per hour per second, corresponding to a force of 150 lbs. per ton braking effort.

The constants assumed in these curves are the same as before, 15 lbs. per ton friction rate, and 150 lbs. per ton braking effort applied uniformly until the train comes to rest at a distance of 2,000 ft. from the start. While the braking effort determines the minimum length of time for the run, the friction rate imposes a limit upon the maximum rate of acceleration possible for length of time greater than 128 seconds for 2,000 ft. run. That is, a train accelerating with an infinite rate and coasting the entire length of 2,000 ft. would come to rest in 128 seconds with no energy loss in the brakes, and any longer interval of time occupied in the run would require some finite rate of acceleration at a maximum. This is pointed out in Fig. 3, where for a run in 210 seconds the maximum rate of acceleration possible is .175 miles per hour per second, corresponding to 24 lbs. per ton. No train in practice would require such a long time as 210 seconds, nor would it be possible to make a run of 2,000 ft. in 41 seconds, but these curves have been carried out to show the limits for a given set of conditions.

As the energy lost in braking is proportional to the square of the speed when the brakes are applied, the curve A-B, Fig. 3, being the locus of the minimum rates of acceleration, that is,

corresponding to an energy consumption of 298 watt-hours per ton-mile, this value being the greatest amount of energy that can be expended on the run with 150 lbs. per ton braking effort.

All energy values are net, that is, they represent the amount of energy required to accelerate the train plus energy lost in overcoming friction, and hence take no account of any losses occurring in actual operation in the motors, rheostats, gearing, etc.

Fig. 4 shows the economy resulting from properly proportioning the accelerating rate to the schedule speed and distance traveled. For example, a train accelerating with a tractive effort of 100 lbs. per ton and making 20 miles per hour average speed, not including stops, will require 127 watt-hours per ton mile, which would be reduced to 65 watt-hours per ton mile if the tractive effort had been increased to 150 lbs. per ton, or, in other words, the generator capacity would be but half as large for the same service.

The curve of 300 lbs. per ton tractive effort is interesting as it represents about the maximum speed attainable with modern apparatus for a distance of 2,000 ft. with the assumed constants of friction and braking effort. Assuming the entire weight of the car to rest upon drivers, about 300 lbs. per ton would be available for traction without slipping the wheels on an average track, so that an average speed of 26½ miles per hour is the highest that could be obtained over a distance of 2,000 ft., not allowing any time whatever for coasting.

All previous curves have been based upon the assumption that trains are allowed to coast after reaching maximum speed, and also that acceleration is carried on at a perfectly uniform rate until power is shut off, but in practice this assumption may

be modified somewhat, the starting resistance being cut out before the maximum speed is reached, and the latter part of the acceleration carried on at a constantly decreasing rate upon the motor curve.

Another method would be to accelerate at a constant rate until maximum speed is reached, then continue this speed constant by supplying motors with just sufficient power to overcome train friction. This latter method of train acceleration, however, demands such a considerable increase in the amount of energy required for the run that it has not hitherto been considered.

The three methods of acceleration are illustrated in Fig. 5, showing the three forms of speed curves, *a-a* accelerating at a constant rate and coasting after maximum speed is reached until brakes are applied, *b-b* accelerating at a constant rate and continuing at full maximum speed until brakes are applied, and *c-c* accelerating at a constant rate until starting resistance is cut out and further acceleration allowed to continue at a constantly decreasing rate with constant full line potential at motor terminals until maximum speed is reached, when train coasts until brakes are applied.

value of 30 watt-hours per ton-mile, that is, the minimum energy expressed in watt-hours per ton-mile expended for a given run will be double the friction rate. The actual factor is 1.98 and forms a very convenient method of determining the net energy consumption for any speed and train weight if the friction rate be known. Thus, assuming the light load efficiency of a railway motor, including gear loss, to be 75 per cent, a friction rate of 15 lbs. per ton would demand an input of 40 watt-hours per ton mile, corresponding to an input of 1,200 watts per ton weight of train at, say, a constant speed of 30 miles per hour.

A number of interesting conclusions may be made from the foregoing investigation of the operation of trains upon a level track.

1st. The rate of acceleration determines the energy consumption for a given run, and since this energy consumption decreases with increased rate of acceleration, the train should be brought up to speed as quickly as possible and allowed to coast to secure the minimum energy input.

2nd. The maximum current input during acceleration increases with the rate of acceleration, and hence limits the rate at which a

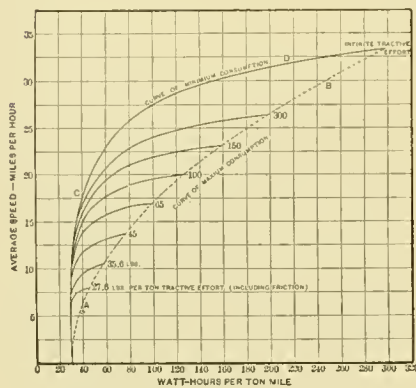


FIG. 4.—SPEED-ENERGY CURVES.

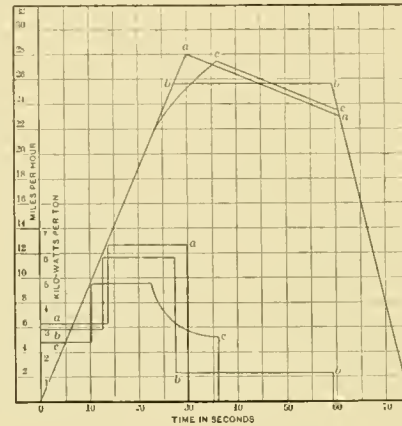


FIG. 5.—SPEED CURVES.

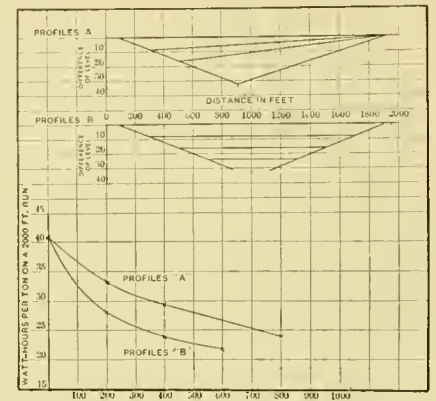


FIG. 6.—ENERGY CURVES.

Curve *a-a* reaches the highest maximum speed but wastes the least energy in the brakes, and hence is the most efficient run mechanically, curve *b-b*, the constant speed method, being the least efficient.

As these three curves were plotted from the speed torque curves of an actual motor, it is instructive to compare the watt-hours consumed for each run with series parallel control, operating two motors in series, then in multiple. To this end a set of energy input curves have been plotted in Fig. 5, showing that curve *c-c* requires the least maximum energy input, while curve *a-a* requires the greatest amount.

The area enclosed by the energy time curves is a measure of the average energy consumption for each run, and their respective values reduced to watt hours are:

- a. Constant current and coasting, 147 watt-hours per ton.
- b. Constant current and not coasting, 160 watt-hours per ton.
- c. Constant current and acceleration on motor curve, 126 watt-hours per ton.

Hence, of the three methods, curve *c*, making use of the acceleration due to a series motor curve, not only requires the least maximum current input, but also requires the least average energy input to the motors for a given run and hence is the form of curve used in the majority of actual runs. Although the energy given out by the motors in run *c* is greater than in run *a*, as evidenced by the higher speed at which brakes are applied, yet this extra work is done so much more efficiently, owing to the smaller starting resistance loss, that the total watt hours input becomes less.

Whatever form of acceleration curve be used, the results arrived at in Fig. 4 will not be greatly modified if similar forms of curves are compared, and, being expressed in terms of actual work done, may be used for any run with a factor expressing the efficiency of acceleration: that is, the ratio of actual work done to the total energy input.

It will be noted that all curves of Fig. 4 approach a minimum

train can be accelerated with a given feeder loss or feeder investment.

3rd. In order to reduce the average energy consumption and also the maximum current input to a minimum for a given run, a due amount of acceleration should take place on the motor curve after starting resistance is cut out, hence a motor should be carefully proportioned for the work it has to do.

4th. A normal amount of coasting should be permitted after power is shut off, partly to provide a margin to allow for errors of judgment of the motorman, but largely because this is the most efficient method of accelerating a train. On no account should the maximum speed be continued by supplying the motors with just sufficient current to overcome train friction, as this method of accelerating is extremely wasteful and inefficient.

Having discussed various methods of accelerating, it is interesting to follow out the problem, and determine the actual efficiency of transporting passengers by our modern methods of travel. It has been pointed out that only 15 to 20 per cent of a fully loaded train consists of a paying load, and with an average load as carried throughout the day this percentage will be reduced to 10 per cent or less, that is, nine-tenths of the energy consumed in moving this train at a constant speed is wasted. But in rapid transit work a train seldom attains a constant speed, due to the frequent stops and high schedule speed, and at least ten times the energy required to overcome friction alone must be expended in accelerating the train, only to appear as heat in the brake shoes when bringing the trains to rest. That is, considering the friction work of the train as the only useful work done, an efficiency of only 10 per cent is reached in the average run. But only 10 per cent of this friction work is useful in moving passengers, hence the actual passenger efficiency is reduced to less than 1 per cent of the total energy delivered to the train during acceleration.

When it is considered that further losses occur in operation in the motors and their method of control, in the transmission lines



and generators of an electric traction system, it will be appreciated that the present method of transportation, with its efficiency of a fraction of one per cent, opens a wide field for improvement. This applies with greater force to rapid transit service using steam locomotives as a motive power, as the dead weight carried per passenger is greater with a steam locomotive than with a motor car, and the efficiency from the coal pile is much less. Hence some means of reducing the large loss, due to accelerating the train is desirable, and this is found in the adoption of an artificial profile, as followed out in a large underground road now building, using down-grades in starting, and up-grades to retard the train when stopping.

The ideal profile would provide for a down-grade at starting sufficient to do the work of acceleration and with an up-grade to do the entire braking required, thus leaving only the friction energy to be supplied by the motive power. Such a road would operate at 100 per cent efficiency, neglecting the dead weight of train carried and considering total friction work as useful work.

Reduced to practice, this ideal grade must be modified considerably. The per cent grade used is limited partly by the rapidity of acceleration that may be imparted to the train without discomfort to the passengers and partly by the available tractive effort of the motive power, which must be sufficient to haul the train up the grade in case of necessity.

A second modification occurs in the necessity of having stations placed on a level track, and since a train has an appreciable length, it must travel its own length before the last car is off the level and the full effect of the grade is felt. Thus, during the first period of acceleration the rate is comparatively small and must be furnished by the motors, resulting in a material reduction in the energy gain in the theoretically ideal profile. An artificial profile can only be secured on elevated or underground roads, and a double track road necessitates two separate overhead structures and the underground road must consist of two separate tunnels with unlike profiles.

Assuming two stations to be on the same level, there are two forms of profile that may be assumed with a given maximum difference in levels, as shown in Fig. 6. Profile A consists of a down-grade with a level track at each terminus equal to the length of train operating over the road, while profile B consists of a down-grade and up-grade equal in length and percentage with a level track connecting them, and also a level track at each station equal to a train length.

In practice a perfectly symmetrical profile, as in B, will not be possible, as the level tract connecting grades must be replaced by a slight grade to provide for drainage in tunnel roads, this grade preferably opposing the direction of movement of the train.

In order to ascertain the behavior of a train upon the two forms of profiles and to determine the most efficient form of grade, a series of curves have been plotted upon the following assumptions.

Length of run total, 2,000 ft.

Train friction, 15 lbs. per ton constant.

Braking effort, 150 lbs. per ton during time brakes are set.

Running time, 75 seconds.

Length of train, 200 ft., corresponding to an average train of four to five cars.

Tractive effort, as supplied by motors, 100 lbs. per ton. (This effort being supplied irrespective of added effort due to grades.)

No running is assumed to take place on the motor curve, and train is supposed to coast after reaching maximum speed.

Motors are controlled by the ordinary series-parallel method, starting with two motors in series and throwing them into multiple, the starting resistance being supposed to be cut out uniformly so that 100 lbs. per ton motor effort is maintained constant while current is on.

Due regard is paid to the fact that the tractive effort due to grade depends upon the proportional length of train off the level track at the stations, and hence is a constantly increasing quantity until the entire train is on grade.

A grade of four per cent has been chosen for the down-grade in A, and for both down and up grades in B; and energy consumption plotted in Fig. 6 for different lengths of grade.

Thus for a run of 2,000 ft. in 75 seconds, the energy input with series parallel control is 40.75 watt-hours per ton for a level track, which is reduced to 27.8 watt-hours in curve A with a length of 500 ft., 4 per cent grade and 22.6 watt-hours per ton

in C, with the same length of 4 per cent grade, that is, with the same vertical fall.

A length of 500 ft. of 4 per cent grade calls for a vertical fall of 20 ft. which is not excessive in practice, hence by the use of a profile similar to B, Fig. 6, the energy consumption for a given run may be reduced as much as 40 to 50 per cent from that required on a level track.

With proper proportioning of the gear ratio of the motor allowing some acceleration on the motor curve, this saving in energy consumption could even be exceeded, so that a rapid transit road, especially a tunnel road, properly laid out with an artificial profile, could operate with a very much less energy consumption than an existing surface road.

In conclusion it may be pointed out that the electric motor is eminently adapted to rapid transit service, owing to its ability to accelerate rapidly; and for tunnel work especially, it has no rival, adding to its high efficiency of operation its perfect immunity from smoke and gases.

### HEROIC EXAMPLE FOR RAILWAY MEN.

The portraits are here given of the conductor and motor-man in the employ of the Chicago General Railway Company who heroically repelled the attack of three highwaymen. On the 10:10 p. m. trip, June 22, east bound on Laffin street, the car was approached by three men and the speed was slackened for them to get aboard. As the third man stepped on the platform he caught the door-pull and staggering as if falling closed the door. Conductor E. L. Stickney caught him to prevent his falling but quickly realized his mistake when the supposed passenger covered him with a revolver and ordered "Hands up quick and make no noise."



E. L. STICKNEY.

TIMOTHY MCAULIFFE.

The conductor pushed the revolver aside and seizing the man threw him off the car. The two other robbers came to the assistance of their fallen comrade with revolvers ready for service. The conductor boldly attacked the second one and forced him off the car while it was going at a high rate of speed. The third man snapped his revolver but fortunately for the brave conductor the cartridge failed to explode and then the robber dealt him a blow on the head with his revolver, inflicting a slight scalp wound. The motor-man, Timothy McAuliffe, and a passenger came to the conductor's assistance in his unequal fight and threw the third highwayman from the car. The conductor stepped to the lower step of the car, revolver in hand, and was shot at by one of the robbers. He returned the fire four times, two of the bullets striking one of the men, very seriously wounding him. The police captured all three of the bandits and they are bound over to the grand jury. This successful resistance will likely put a stop to hold-ups on the Chicago General Railway whose lines run through some outlying districts.

## LIGHTNING ARRESTERS.

An Address before the Northwestern Electrical Association, on board S. S. Northwest, by A. J. Wurts.

My attention has been recently called to the numerous inquiries which are being made for information regarding the protection of electrical apparatus against lightning. At the recent electrical congress held in Geneva, a special effort was made to collect reliable data from the central stations scattered over Europe. A little more than a year ago the Elektrotechnische Verein, of Berlin, offered a considerable prize in money for the best paper among its members on the subject of lightning arresters. Not long ago the president of a large power transmission plant in the west wrote to me, asking whether in my judgment I thought it feasible to operate a power transmission plant through thunder storms, adding that prospective stockholders and customers were expressing considerable doubt regarding the possibility of continued service in a section of the country where thunder storms were frequent. My answer was in the affirmative, and I pointed to the successful operation of power plants in various parts of the west, more particularly to the plant of the Telluride Power Transmission Company, which has now been operating for many years without any interfer-

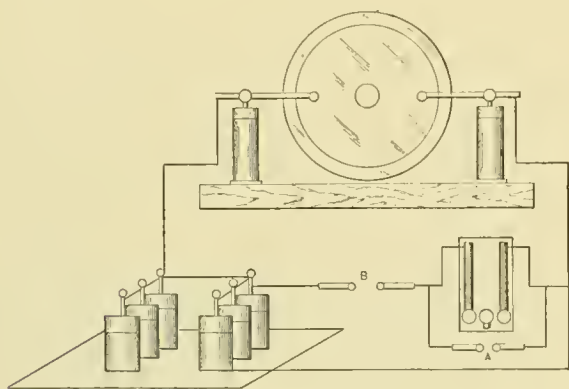


DIAGRAM OF APPARATUS.

ence whatever from lightning, and now, although I have written quite a number of articles bearing upon this subject, I am once more asked for my views, which it is needless for me to say are always gladly given.

The subject is long when treated from beginning to end, and as our time is limited I will confine my remarks more especially to the testing of lightning arresters, with the idea of giving central station men the benefit of my experiments and leaving them finally to draw their own conclusions. I have been led to dwell on this particular part of the general subject of lightning arresters by reason of some experiments which I have made on a lightning arrester, recently placed on the market, and which has been called a "short gap" lightning arrester; and as this particular instrument has but one air gap, although placed in series with what has been termed by the manufacturers of the arrester a "low resistance," and as the Westinghouse arrester for the same kind of service has three gaps, the inference is that the latter is comparatively speaking a "long gap" arrester.

Inasmuch as it has always been generally accepted that lightning arresters should have good copper connections between line and ground, with soldered joints and a thoroughly good ground plate, it seemed to me at the onset rather strange and inconsistent that one should deliberately place in the lightning arrester itself, a resistance, which, compared to the lightning arrester connections, was not a "low resistance" but a very high resistance. Furthermore, it was claimed for the short gap lightning arrester that it would break down at a much lower e. m. f. than other devices having more than one spark gap. This statement although true is very misleading; for the breaking down e. m. f. of a spark gap is in no wise dependent upon

the resistance which may be in series with that spark gap. For instance, the lightning arrester in question has 60 ohms in series with its spark gap, but the breaking down e. m. f. of this gap would be just the same if the resistance in series were a thousand or a million ohms. What has the breaking down e. m. f. of a lightning arrester to do with this subject? In my judgment, none whatever. It seems to me that dynamo e. m. f. and dynamo current are absolutely foreign to the primary function of a lightning arrester which is to carry off disruptive discharges with the least possible resistance. We might put the question this way: Does the breaking down e. m. f. of a spark gap lightning arrester, bear any relation to the resistance which that lightning arrester may offer to the passage of disruptive discharges? My experiments indicate that it does not, at least as far as permanent resistances are concerned. By permanent resistances I mean resistances which *conduct* disruptive discharges, such as German silver wire or a choke coil, in distinction from resistances which may be *broken down* by the passage of disruptive discharges, such as air and other insulating fluids. I think it will be obvious to anybody who has given this matter the slightest consideration that a disruptive discharge might easily break down a single spark gap of  $\frac{1}{2}$  in., or a number of spark gaps aggregating the same distance, which would have a very high breaking down e. m. f. Whereas, it is also quite obvious that a very small spark gap connected in series with one thousand or several thousand ohms might have a very low breaking down e. m. f., but such a device would offer a relatively higher resistance to the passage of disruptive discharges. I now invite your attention to the following experiments.

In determining the resistance of a lightning arrester or the strength of insulating material with reference to lightning by using the disruptive discharge itself, I have placed in shunt to the object whose resistance is desired a secondary or shunt path whose resistance may be easily adjusted and made to balance any resistance placed in shunt with it. For example, referring to the diagram representing a static machine, a battery of Leyden jars and a circuit which may be established through an initial spark gap B and through a lightning arrester or other device, in shunt with which a variable spark gap A is connected. The length of the variable spark gap A is to be the measure of the resistance which the lightning arrester or other device will offer to the passage of disruptive discharges under the conditions of the test. In making this experiment the apparatus is connected as shown and the A gap is at first closed, then as the sparks begin to pass the A gap is gradually increased until a balance is established between the path through the arrester and the path through the A gap, such that the sparks will pass indifferently through one or the other. The length of the A gap may then be said to be a measure of the resistance which the lightning arrester offers to the passage of disruptive discharges.

In making these measurements with a double pole, "short gap" lightning arrester, shown connected in the diagram, and which has 120 ohms in series with two spark gaps, I have found the value of A to be 9.32 in.; whereas, when a similar test is made with a Westinghouse double pole lightning arrester, which has six gaps in series, the value of A was found to be only 3.32 in. Thus, the resistance which the "short gap" lightning arrester offers to the passage of disruptive discharges is three times greater than that offered by an arrester having three times as many gaps. Furthermore, it was noticed that the sparks which passed through the "short gap" lightning arrester were very small, compared with those which would pass through a gap or series of gaps without resistance, and the sound which was emitted by the spark over the short gap arrester was also insignificant, indicating that the amount of discharge which passed was relatively small and that the path must necessarily be restricted in some way; and this conclusion was verified in the following manner:

Referring to the diagram, the A gap was removed, the static machine was driven at a constant speed and the number of discharges which passed through the "short gap" lightning arrester in a given time was counted. The "short gap" arrester was then replaced by the Westinghouse arrester and the same test repeated, with results as follows:



Tets No. 1.	No. of Discharges.	Duration Minutes.	Rate per Minute.
Westinghouse . . . . .	50	5	10.0
"Short Gap" . . . . .	62	5	12.4
Test No. 2.			
Westinghouse . . . . .	40	5	8.0
"Short Gap" . . . . .	55	5	11.0

It will be noticed from the above that the rate of discharge for the "short gap" arrester is greater than that for the Westinghouse arrester, and in my judgment this difference is due to the presence of a high ohmic resistance in the "short gap" arrester, and the reason of this high rate is that the "short gap" arrester owing to its high resistance cannot completely discharge the battery of Leyden jars, consequently it requires less time to recharge and the discharges occur more frequently, but the quantity of the static charge which passes through the arrester is relatively small. In service this feature is liable to cause a splitting of the discharge, causing one part to pass through the arrester and the other through the insulation of the system.

Now, to further show that the method of using a variable shunt gap to measure the resistance which a lightning arrester offers to the passage of disruptive discharges is reliable, I attempted to verify the results already obtained, in which the resistance of the "short gap" arrester was found to be three times that of the Westinghouse, by placing three Westinghouse arresters in series and then connected this series in shunt to one short gap arrester. Upon the passage of disruptive discharges I found that the three Westinghouse arresters in series just balanced the single "short gap" arrester, thereby verifying the previous results and again demonstrating that the resistance of this particular lightning arrester was three times as great as the Westinghouse, and in general, that an ohmic resistance such as here used provides a relatively poor path for the passage of disruptive discharges.

These results are not altogether in accordance with some of the popular ideas regarding lightning arresters and disruptive discharges, the prevailing idea being that if a spark can jump through even a very short distance of air, a few ohms connected in the circuit could not materially increase the resistance of the path for the discharge. It is generally granted that disruptive discharges are oscillatory and that coils offer a very high resistance to the passage of such discharges, but that a few ohms resistance should considerably impede the passage of the discharge may be somewhat new to central station men, and I desire to offer the following explanation of this phenomenon.

Let us bear the following points in mind. Air is easily moved out of the way. An ohmic resistance such as we have been talking about is fixed as far as the current flow is concerned, and the discharge is oscillatory, at least, it is generally accepted as such. Now, when a disruptive discharge passes over a spark gap without resistance in series, the work which the discharge has to do is simply to remove the air of the spark gap which obstructs its passage, and this being done by the first oscillation, the air is perforated as it were and the path is then free for further oscillations to complete the discharge; whereas, when an ohmic resistance is connected in series with such spark gap, although the spark gap itself may be broken down as before, still the ohmic resistance remains in the circuit and each oscillation has to take place through it, thereby enormously increasing the actual work which must be performed before complete discharge can take place. I would call the simple spark gap arrester a "free path" arrester and the arrester having a resistance in series, a "restricted path" arrester.

Perhaps the following illustration will make this idea a little more clear: Let us imagine two empty water pipes, one having in it a thin glass diaphragm, the other a thin steel diaphragm, in front of which is a strong steel diaphragm with a small hole in it. Now with a sudden rush of water through the first pipe the glass diaphragm is instantly shattered and the path is free for the further and complete discharge of the water which may follow; but with the second pipe, although the glass diaphragm may be shat-

tered by the first on-rush of water, still the steel diaphragm remains as a permanent resistance for all the water which may follow.

Having placed these ideas before you, I will leave them that you may draw your own conclusions.

Finally, I wish to call your attention to some remarks which I have noticed recently in our technical literature. In one instance it is stated that the high insulation which we are now using increases the danger from lightning, that some years ago, when a poorer quality of insulation was used, the lightning had a better chance to leak to ground through this weak and otherwise defective insulation. I take exception to any such statement as this, for the simple reason that experience does not warrant it. I am sure that many of you will remember how that our shellaced cotton insulation on smooth body armatures was in constant danger from burnouts during thunder storms; whereas with our modern apparatus and higher grade of insulation the trouble from lightning is comparatively rare. If there could be any such thing as a leak of the static discharge to earth, certainly this leak would take place from our trolley wires through the many lamp circuits as well as the copper circuits through motors and armatures to earth.

In another instance the bold statement is made that "at the present day the most satisfactory and effective method of protecting is that one in which a grounded wire is strung in proximity with the line wires." It seems to me very curious that this method is not universally adopted if so satisfactory and effective. The statement hardly requires further comment.

Referring now to the rules and requirements of the National Board of Fire Underwriters on lightning arresters, I will read the following: "Must be connected with a thoroughly good and permanent ground connection by metallic strips or wires having a conductivity not less than that of a No. 6 B. & S. copper wire, which must be run as nearly in a straight line as possible from the arresters to the earth connection." It seems to me that this rule which provides for thoroughly good and low resistance connections, to be consistent and to have real value should also include some specification regarding the resistance which the lightning arrester may offer to the passage of disruptive discharges.

On another page of these rules I found as follows: "In no case should the ground wire from a lightning arrester be put into iron pipes, as these would tend to impede the discharge." Personally, I am very curious to know whether this last statement is based on theory or actual test. As I had made many other tests indicating that such an iron pipe would not impede the passage but really assist it, I determined to make this particular test, and found as had been anticipated, that the presence of the iron pipe actually helped the discharge, that is, lowered the resistance of the wire passing through it. I think the reason for this is, that the iron pipe acts as a short-circuited secondary.

## CORRESPONDENCE.

Our April issue contained a description and illustration of the handsomely decorated cars which the boys in New Orleans fitted out on the occasion of their annual celebration. The article called out the following courteous expression:

New Orleans, May 31.

EDITOR STREET RAILWAY REVIEW:

In behalf of the Board of Managers of the New Orleans Traction Company Employees Aid Association, I desire to transmit to you their united thanks for the very flattering words contained in your issue of April 15.

With best wishes of our association, I remain,

Yours respectfully,

C. E. HINGLE, Secretary.

An attachment of \$50,000 levied upon the franchises of the East Oakland (Cal.) Street Railway, has been dissolved.

## ELECTRIC TRACTION FROM AN ENGLISH POINT OF VIEW.

At the third annual convention of the Municipal Electrical Association held in London on June 10, the subject of Electric Traction was treated in separate papers by R. C. Quin, borough electrical engineer of Blackpool, and J. E. Stewart, borough electrical engineer of Derby. Mr. Stewart, in his paper, advocates the adoption of the trolley system, the combination of the lighting and traction generating stations, and the municipal ownership of both. The following is an extract from Mr. Quin's paper on "Electric Traction":

It goes without saying that the subject of Electric Traction is so important and extensive that it is impossible to deal with it comprehensively in a paper of this description. The author proposes, therefore, to set forth as briefly as possible the salient points of the subject.

**Road.**—In the author's opinion the road, or permanent way, is one of the chief factors which determine the success or failure of any electric traction undertaking, inasmuch as its condition will have a much greater effect upon the maintenance costs, and consequently, the financial result, than would probably be the case with any other system of traction.

Considerable difference of opinion seems to exist as to how this track should be constructed—whether the rails should be 43 lbs. per yard as upon the Giant's Causeway line, or 92 lbs. per yard as upon the Blackpool line—whether the gage would be 3 ft. or standard gage. The weight of the rail must of course be proportioned to the weight of the cars running thereon, and to the soil upon which the rails are laid; but it would appear to the author that the present practice errs too much on the side of lightness. It will be admitted on all hands that smooth running is essential to the longevity of the rolling stock; and that this cannot be attained without rigidity of construction, smoothness of running surface, and accuracy of gage.

In order to insure these desirable ends it is essential, in the first place, that the track should be well laid on a good solid foundation, accurately gaged, and substantially cross-tied. The usual cross-tie for tramways purposes is  $\frac{1}{2} \times 1\frac{1}{2}$  in. strap hammered round at each end, and threaded and bolted through the web of the rails; but at Hamburg—at which place it has been the author's privilege to investigate the permanent way construction—things are done on a decidedly better plan. Here, the rails, which weigh 106 lbs. per yard, are cross-tied by an I-shaped girder, 4 in. deep, which passes under the bottom flanges of both rails, and is secured at each end by two substantial and adjustable chairs. These ties are placed about 6 ft. apart.

The rails also are not butt jointed, but have a half and half lap joint, with a longitudinal cut through the web about 10 in. in length. The fish plates securing these are 2 ft. 10 in. long fastened by six  $\frac{7}{8}$  in bolts. The fish plate on the tread side of the rail passes under the bottom flange as far as the web. This class of rail joint is one which, in the author's opinion, very nearly approaches the ideal. It has unbroken running surface, is rigidly constructed, and has a large rail to rail contact. The cross-over roads at Hamburg are also of unique construction. At these points the groove of the rail is gradually shallowed until at the actual crossing point it is  $\frac{3}{4}$  in. as against  $1\frac{1}{4}$  in. at other parts of the rail. The flange of the wheel projects one inch; hence at these points continuity of running surface is attained by riding on the flange of the wheel.

**Generator.**—Shall it be high speed, slow speed, direct coupled, belt, or rope driven:—if with the latter shall the fly-wheel be placed upon the engine or the dynamo? On the question of fly-wheels, the author begs to state his opinion that the fly-wheel should be left at the factory, as there is quite sufficient fly-wheel effect in a tram car. The author further ventures to suggest that what is required is not so much uniform speed of the engine, or uniform c. m. f. of the line, as uniform motion of the tram cars, and in his experience neither of the former are absolutely essential to the attainment of the latter.

Slow speed engines, direct coupled and belt driven alike, are doing good service in traction work both in this country and on the Continent. But of these, so far as regards modern plant, he cannot speak from personal experience. He has within his charge for lighting purposes, however, engines varying in speed from 80

to 5,000 r. p. m. The traction plant is of the latter order, i. e. direct coupled, Parson's steam turbines, electrically governed. These turbines have been working since June, 1897, to the present time and seem well adapted for the purpose. Their efficiency is extremely good; the attention and cost of maintenance at present extremely small; while the automatic regulation is everything that could be desired.

The extent to which this range of regulation is called upon depends of course in a very large measure upon the weight of the cars, the number of starts per hour, the gradients, and finally, the starting gear.

**Motors.**—The motors for traction purposes should certainly be of the enclosed type, as far as possible watertight; and their capacity such as to enable them on an emergency to develop, for short periods, at least three times their normal power. The truck, carrying the motor or motors, should be rigid in construction;—flexibility being given solely to the supports of the car body and of the motor. The efficiency of a traction motor, though of course an important point, is not of such great moment as with stationary motors. The question of weight as well as efficiency has to be considered; and the question, after all, amounts solely to how much power it will require to move the total weight of car, equipment and passengers, a given distance at a given speed, on a given length of track. The efficiency, again, should be greatest at certainly not more than three-quarters of the maximum power of the motor, or preferably at its usual working load.

The arrangements for oiling should be such that while giving efficient lubrication, oil should not be able to obtain access to the inner portion of the case. Certain makers of traction motors now cover the bottom coil of the field magnet with sheet lead. This is a good preventive of failure due to the access of moisture, dirt or oil; but it would be better if these could be entirely excluded.

In the author's experience, the weakest point in a traction armature is at the junction of the winding and the commutator.

There seems at present to be no settled practice as to the number of motors to be fixed upon a car. The author considers, however, that two motors should always be installed—either of which should be sufficiently powerful to take the car home in case the other breaks down. Further, that the starting arrangements should be such that the two motors are placed in series with a resistance and with one another at starting, and that under normal working conditions they should be in parallel; series wound motors of course being used.

The tram cars in the author's charge are at present all driven by worm gear. The worms are steel,  $4\frac{1}{4}$  pitch, having three parallel threads. The worm wheels are gun metal. The whole is contained in an oil case; the worm is fitted with end thrust ball bearings. Worm gearing, if well fitted, is efficient; but the wear and tear are great so that it does not long remain in an efficient condition. The worm gear is now being replaced by single reduction gear.

The nature of the controlling gear has an important bearing upon the economic working of a traction system. It has not only an immediate effect upon the revenue account but affects also the life of the motors and of the generators, not to speak of the comfort of the passengers. Moreover, with good controlling starting gear, the maximum current taken momentarily by the car is considerably reduced, and with many cars working, and therefore many cars starting simultaneously, the amount of generating plant is most appreciably affected.

Within the author's experience, cases have arisen under working conditions of the maximum current being eight times greater than the normal; this of course being with crude starting gear. If this maximum were not to exceed the normal by, say, 50 per cent—and it certainly need not—the necessary amount of generating plant would be very considerably reduced.

As bearing upon the question of the effect of controlling gear upon the life of motors, an incident which happened not very long ago may perhaps point a moral. A certain car, fitted with a series resistance and multiple contact switch as starting gear, stood upon a heavy gradient. The engineer in charge ventured to start the car, the immediate effect of which was to burn out a motor armature. On a second occasion under similar circumstances he again attempted to start, but this time burnt out the armature of one of the generators. But not to be beaten he repeated the operation under somewhat different conditions. The car was now equipped with a series parallel controller—the me-



tors being the same. On this occasion he was successful, as on all subsequent occasions when this experiment was tried.

**Cars.**—Double deck cars are almost invariably used in England for urban tramway purposes. The practice, however, on the Continent is just the reverse. With the exception of Paris, single deck cars seem to be the rule. The correct size of a car and the number of passengers it should carry, are questions which cannot be settled until the conditions of traffic are known. If the line is double throughout a large number of cars can be conveniently worked. If it is a single line and loops, the workable number of cars becomes limited, and their capacity therefore must be proportioned to the requirements of the traffic.

If the amount of traffic varies within wide limits during certain portions of the day, or at certain seasons of the year, it would appear to the author advisable to attach trailers to the motor cars at those times, rather than to carry a heavy dead load of car weight the whole time. While on this point the author would suggest that some better unit of efficiency working might be established than the cost per "car-mile." What is a car-mile? Is it a trailer car carrying 15 passengers and weighing three to four tons; a motor car carrying 30 passengers and weighing seven to eight tons; or a motor car carrying 80 to 90 passengers and weighing anything up to 23 tons? He would suggest "ton-mile" as a better unit.

**System of Feed.**—The preceding remarks apply with equal force to all methods of electric traction, but the most debatable feature in the question is the means to be adopted of conveying the energy from the generator to the motor. The trend of technical as also of public opinion in this country appears to be in favor of overhead. It is, the author believes, admitted by all that it is the cheapest method, but some have qualms as to its sightliness and safety. These points it is obvious with a little skill and forethought, can be easily provided for. Strong posts of ornamental construction are now obtainable, and when used for the joint purpose of lighting the street and supporting the overhead conductor cannot be objected to by the most critical. The overhead line must always be in evidence, but it is remarkable how accustomed one can become to it, so much so as not even to notice its presence. The best means of ensuring safety is good work—first-class materials, and sound construction. The gage of the trolley line should not be less than No. 000 S. W. G., although No. 0 B. & S., appears to be the general thing on the Continent. Two overhead conductors should be provided even for single line and loops, being, the author considers, cheaper in the end than spring frogs and other expedients. Section blocks should not, under any circumstances be placed in curves, also they should be provided (when trolleys are used) with guard cheeks to prevent the trolley wheel jumping the line when passing.

The span wire system of support appears best suited to high rates of speed, and is convenient in narrow streets where supports can be attached to the houses, but it necessitates a great number of straining wires at curves which are not slightly. The life of the overhead line is greatly affected by the class of contact making apparatus which is employed. Certainly, the life appears longer with the rolling wheel than with the sliding bar. Whether the advantage which the bar has at curves and junctions sufficiently compensates for this, the author cannot say.

With a trolley line well erected and fitted with guard cheeks at cross-overs and junction frogs, there should be little risk of the trolley wheel jumping the line, but nevertheless such a contingency must be provided for. In the first place, the trolley head when free from the line should not be able to rise to any great extent from its working position. In the second place should it happen that the trolley jumps the line when the car is proceeding at high speed and the head of the trolley locks against one of the supports (either bareket arm, or span wire) something must give way. What will prove to be the weakest link cannot of course be given for certainty, but, should it happen to be the trolley standard, accidents are likely to occur. The author suggests that it would be best to provide the weakest link in the shape of a loose trolley head, and that this trolley head should be anchored by an insulated cord to the trolley arm, say three feet from the top end. The only result then of the locking of the trolley head would be its dropping free from the arm.

It is necessary with telephone or telegraph wires crossing the overhead conductor to provide some means for preventing these wires, in the event of their falling, from making contact with the overhead conductor. There are two ways of doing this: the first

is to fix an insulator such as a wood or other moulding, on the top of the conductor at those points; the second to suspend above the trolley line one or more guard wires. These latter seem to be preferable, as in practice the wood moulding works loose and makes considerable noise by vibration when the cars are passing. The guard wires should be stranded and capable of withstanding as great a stress as the trolley line itself. They should, the author also considers, be efficiently connected to earth. If this is so, a telephone wire coming in contact with the overhead line and the guard wire causes a short circuit and a cut at the generating station.

With overhead system a rail return is almost invariably used, and therefore the question of bonding and of the earth circuit should be considered at this point. For all practical purposes the conduction from rail to rail by fish plates and bolts must be neglected, and it becomes necessary to provide electrical bonds across these rail joints of the same equivalent area as the rail. The rails the author is now using have an area equivalent to 1 sq. in. of copper. The bonds consequently should have this section. Under these circumstances it is preferable to use two bonds, as 1 sq. in. section would be inconvenient.

The heads of the bonds should have a contact area of at least  $2\frac{1}{4}$  sq. in. and should be of such construction as not to render them liable to work slack. It is a good thing in calculating the fall of potential upon a given line to allow 20 per cent for increased resistance due to the slackening of the bonds. Even with this bonding, unless the disposition of the gas and water mains has been carefully considered, the Board of Trade limit of stray earth current is likely to be exceeded.

If a gas or water main crosses the track or approaches the vicinity thereof, and from that point takes a shorter route to the neighborhood of the station earth than do the tramway rails; or has along that line of route a less resistance than the corresponding tramway return it will take a greater proportion of the current than is allowable; then, parallel to that gas or water main, an insulated conductor should be laid from the point of the tramway rails above-mentioned to the negative terminal of the dynamo.

**Accumulators.**—The accumulator system of traction certainly possesses very great advantages—the principal of which is that the service of cars is not dependent on the maintenance of one system of feed, each car being entirely independent; but we have carefully to consider at what cost this independence is obtained. The crux of the whole question is the cost of carrying a useful load of passengers a certain distance, and for this purpose it is as well to see how the question is affected by the adoption of storage cells. There are three heads under which additional expenditure is entailed—first, the interest upon the additional capital required for the installation of the cells and also their depreciation—second, the cost of propelling the additional dead load—third, the inefficiency of the cells.

With cars running all day with one charge, the weight and cost of cells are both very great as a comparison of the cars used in Dresden for overhead line only, and of the cars at Charlottenburg for accumulators, will testify. Dresden cars carrying 40 passengers weigh eight tons: Charlottenburg cars carrying 42 passengers weigh 23 tons. In both cases the useful load of passengers is approximately three tons. The cost of the accumulators used on the latter cars is about £750 per car.

The cost of traction accumulators varies from £75 to £125 per ton, the former figure being for rapid charging and discharging short-distance cells.

The author was much interested in the statements made by Mr. Epstein in his Institution paper (on the authority he believes of the Hanover Tramway Company) that the cost of the accumulator system of working there was only .4 cent per car-mile greater than the overhead system; and he must confess when making his recent visit to Hanover, he did so with the intention of ascertaining how that .4 cent was arrived at. To a certain extent he was unsuccessful, the cost of the maintenance of the cells not being obtainable; but he believes that the figures which he has obtained are sufficient to effectually disprove that statement.

There is in Hanover one line of rather less than 10 miles, worked entirely by accumulators—the cars working that line being also equipped for the overhead, so that they are interchangeable with cars working on the combined system. They weigh  $11\frac{1}{2}$  tons and carry 36 passengers. The time occupied in running

this journey exclusive of charging and stoppages is 45 minutes. The cells are charged at two stations en route, at one of which eight minutes charge is given at constant potential and at the other 25 minutes. The accumulators are placed under the seats, each car being fitted with 208 cells of Tudor type, and there are three plates in each cell. The weight of these cells is approximately two tons, and the installation cost of each car \$1,000. The energy taken per car-mile on this track was 1.5 k. w. hours. Although the maintenance cost of the cells was not obtainable the average life of the cells was given at about 18 months, and, moreover, additional cars have to be provided on the accumulator line as several cars are always occupied charging.

There is also another line at Hanover worked on the overhead system. Here the cars carry 32 passengers and weigh six tons. The energy taken per car-mile of these latter cars was .68 k. w. hours. On the combined overhead and accumulator system, with cars similar to those in use on the accumulator line, the energy taken per car mile was 1.37 k. w. hours. Leaving the initial cost of the accumulators out of the question, there is the effect on the revenue account to be considered.

With rapid-charging low-capacity cells (which are really the only ones worth considering), the weight of cells for a five miles' journey with one charge is about one ton for every 3¼ tons of car and passengers. Therefore with a car and passenger load of 13 tons we must have four tons of accumulators. As every ton-mile on a given road requires the same expenditure of energy, it follows that the energy given to the motors to propel this car will have to be increased approximately 30 per cent.

Opinions differ as to the efficiency of these cells, but generally the users of them consider that the watt-hour efficiency is about 60 per cent and the author does not think the figure is far wrong. Therefore the energy of charging these cells has to be increased 117 per cent owing to their inefficiency and weight. Further, the wear and tear of the road and cars is increased by the additional weight.

The life of the plates of the cells is variously given by the users as from one to two years, by the representatives of the makers as from two to three years; but the majority of the users do not find much difference between the life of positive and negative plates. The cost of the maintenance of cells is given by the various Tramway Companies using them at from 1½ cents to 6¼ cents per car-mile, and the author thinks a fair average may be taken at 3 cents. Assuming the cost of current to be 1½ cents per k. w. hour and .7 of a unit to be taken without cells, figures the author does not think advocates of accumulators will cavil at, the cost of energy with the overhead system would amount to 1.05 cents, and with accumulators to 2.28 cents, or an additional cost of 1.24 cents.

This added to 3 cents for the maintenance of the cells per car-mile gives us the additional cost of 4.24 cents, neglecting the extra wear and tear of the cars and road.

Now consider the capital cost. The overhead system per mile of double track costs complete, including bonding of the rails, steel posts (on span wire or bracket system) about \$8,000. If these posts are used for street lighting purposes, the cost of the posts should be divided equally under the two heads reducing the overhead cost to \$4,870 per mile of double track, with a 2½ minute service and cars travelling eight miles per hour there will be six cars on the mile section, and, with the weight of the accumulators given, each car would cost \$1,500 to equip, or \$9,000 per mile of double track.

Again, if charging stations were adopted with say 15 minutes charge, six additional cars would be required at an additional cost per mile of \$2,800, making altogether a sum of \$11,800 per mile.

With a slow service of cars the initial cost of the accumulators would probably be less than the overhead, but the additional cost of 4.24 cents per car-mile (with only 20,000 miles per car per annum) capitalized, is equivalent to the sum of \$17,750 bearing 5 per cent for each car running.

The conclusions arrived at by the author all tend to the opinion that in the present state of electric traction engineering there is but one good and reliable, and cheap system, and that is, the overhead. Where a combination is necessary and conditions are favorable, overhead and conduit combined comes next in order of merit. That as at present constructed accumulators are not, from a commercial point of view, a satisfactory solution of the traction problem.

## WOMEN AS CONDUCTORS.

A press dispatch from Chillicothe, O., under date of June 13, thus announces the inauguration of a system that is as yet a novelty in this country:

The electric street car line of this city adopted a new method of conducting business today by placing lady conductors on all its cars. Heretofore the cars had been in charge of the motorman and the fare deposited in boxes. Now the passengers will have their wants attended to by handsome young women, as only those of fine personal appearance have any chance of getting a job. Each lady is compelled to wear a ribbon on her hat with the word "Conductor" inscribed on it.

In reply to an inquiry the general manager of the Chillicothe Electric Railroad, Light & Power Company, J. P. Myers, confirms this report and states that the result has been a clean service and largely increased receipts. Prior to employing women no conductors were used on the cars except on such days as there were large crowds, and then the company would take such pick-ups as it could get, who always lacked experience and gave very unsatisfactory service.

Young women could be secured at a price that the company could afford to pay, and accordingly were hired. They work 10 hours a day with every seventh day off. When on duty they wear uniforms comprising blue skirts, shirt waists and sailor hats with the badges to designate their positions.

At first there was some little criticism of the company but this has been overcome and the women as conductors have come to stay. They were carefully chosen and the success of the experiment is attributed largely to their good behavior.

## INDIANAPOLIS THREE-CENT FARE CASE.

July 1, the supreme court of Indiana overruled a petition for a rehearing in the case of the city of Indianapolis against John N. Navin. This is the test case brought by the city against Navin because he refused to pay a 5-cent fare on the Citizens' Street Railroad, thus violating a city ordinance. This was the method taken to bring the merits of the 3-cent fare controversy before the state courts without putting the city in contempt of the federal court. (See REVIEW for June, 1897, p. 384, and p. 417.) In July, 1897, Judge Showalter, in the United States circuit court, refused to vacate the injunction issued in April restraining the enforcement of the 3-cent fare act because he held it unconstitutional. (See REVIEW for August, 1897, p. 513.)

In its late decision the Indiana supreme court says:

"We are constrained to adhere to our original opinion that the act in question, even if local and special, is not in contravention of any of the provisions of the constitution of this state as contended by the appellant. As to questions arising under the constitution of the United States, we should be constrained to follow the adjudications of the supreme court of the United States without in any wise considering whether such a construction should or should not commend itself to our independent judgment, but upon the requirements of the constitution of the state we are not at liberty to set aside or discard our own views, because of the fact that they do not meet with the concurrence or approbation of any other court however high, or any judge however eminent."

The result is that Mr. Navin will not be punished under the city ordinance, but he will nevertheless pay 5 cents when he rides, at least until the United States supreme court renders its decision on the appeal from Judge Showalter.

In a rear end collision of trolley cars on the Nostrand avenue line in Brooklyn five passengers suffered injuries.



## THE BUFFALO RAILWAY STORAGE BATTERY.

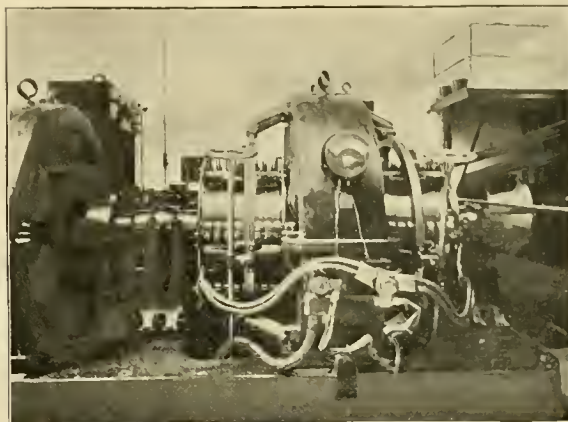
The Buffalo Railway Company has been using its new storage battery for some time, and is well pleased with the results. The battery was installed by the Electric Storage Battery Company, of Philadelphia. It occupies the ground floor of a new brick building especially constructed for it, the size of which is 40x90 ft. at the foundation. It is a one-story, fireproof structure, and stands at the south end of the company's power house on Niagara street. The battery room has a concrete floor and the tanks rest on double petticoated porcelain insulators, which stand on frames, the frames resting on insulating brick laid on the floor.

The capacity of the battery is 1,200 h. p.-hours. It consists of 270 cells, all in series, with 41 plates in each cell. The size of the plates is 15x15½ in. The positive plates weigh 24 lbs. each, and the negative plates 16 lbs. The outside dimensions of the tanks are 59⅞x21½x24¾ in. The tanks are not filled with plates, sufficient room being left so that the capacity of the battery can be increased two-thirds without new tanks being installed. There are ventilators in the ceiling by which the gases are carried from the battery room. A current of fresh air enters the battery room near the floor, and by this means the ventilation of the room is made most perfect.

The battery is operated in connection with the steam plant from 7 a. m. to 7 p. m.) and in connection with the converters during the night hours until it is fully charged. The converters are used in connection with the transmitted Niagara power, of which the Buffalo Railway Company now takes 2,000 h. p.

During the first few hours of the night the battery and converters take the load. From about 9 p. m. to 1 a. m. the

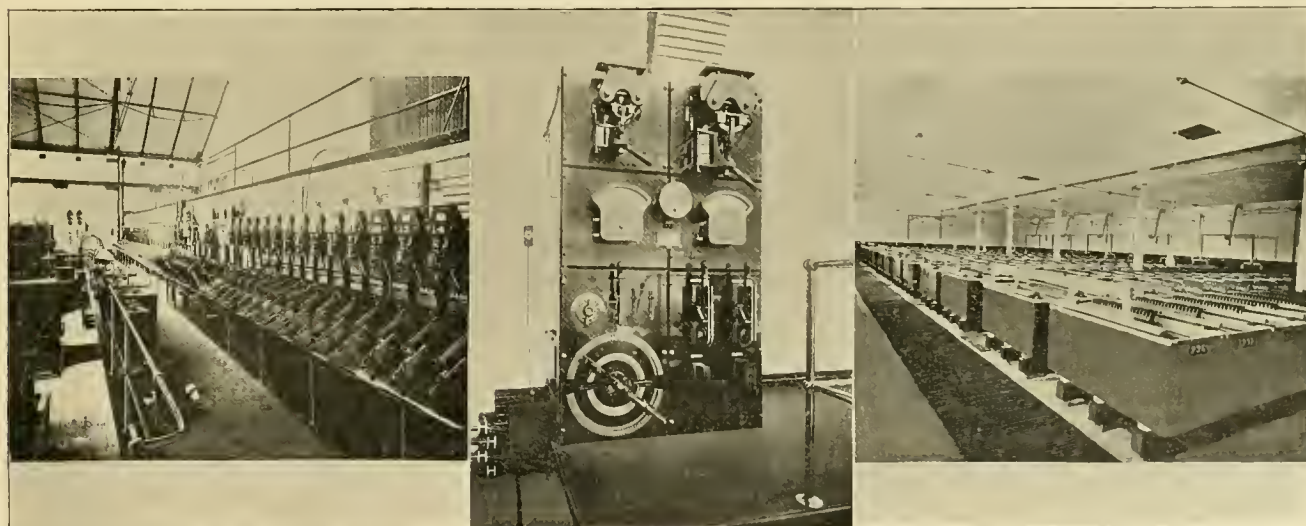
was made by the Western Electric Company and was furnished by the Electric Storage Battery Company. It has a capacity of 3,000 amperes at 70 volts, and performs the duties of regulating, charging and distributing the current of



BOOSTER FOR BATTERY.

the battery. It has two commutators in parallel, and the density of the current under the brushes under full load is under 20 amperes per sq. in. The booster is direct connected to a six-pole, 220-k. w. Western Electric motor. The diameter of the armature is 30 in.; the diameter of the commutator is 24 in. and its length 10 in. The booster proper is also a six-pole machine, the commutators being 29 in. in diameter by 21 in. long. The outside dimensions of the whole unit are 12 ft. 6 in. x 6 ft. 7 in. x 7 ft. in height; the total weight is about 45,000 lbs.

The ends of the battery are connected by leaded copper



MAIN SWITCHBOARD.

BOOSTER SWITCHBOARD.

BATTERY ROOM.

converters are charging the battery from the Falls line. It will be seen that it acts as a regulator on the steam plant during the day. The greatest demand for power comes about 6 p. m. each day and this demand the battery assists in meeting.

In connection with the battery a booster is used, which

bus bars to cables just inside the battery room walls, and the cables run to the switchboard. The switchboard stands on the gallery in the main room of the power house. It is made of black marble and is equipped with differential ammeters to show whether the battery is charging or discharging. Also with differential voltmeters for the purpose of

throwing the battery in parallel with dynamos or converters. A reversing switch connects with the shunt field of the booster for the purpose of changing the polarity of the booster to facilitate the charging and discharging of the battery.

There are two double pole switches, one for throwing the battery in parallel with the dynamo or converters, the second for throwing the battery through the booster or direct to earth, as circumstances may arise.

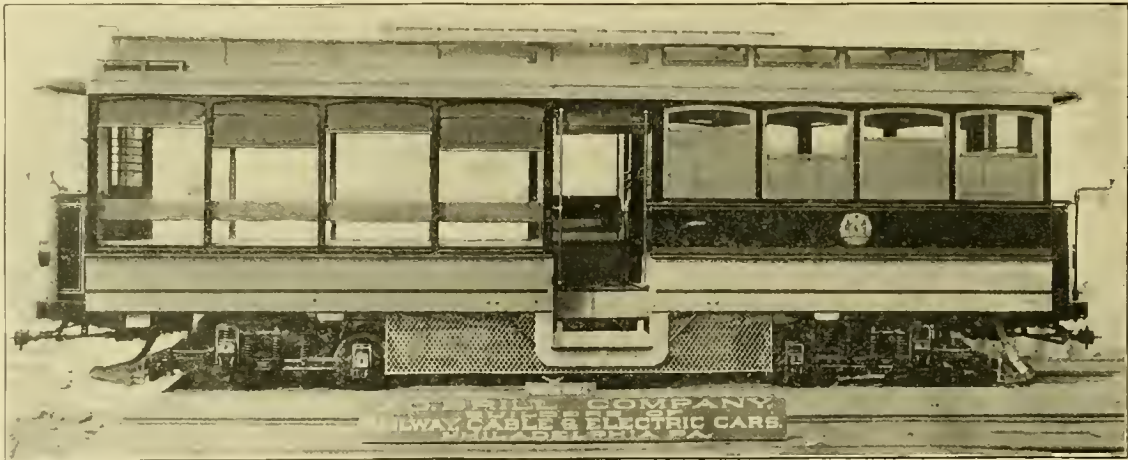
The power house of the Buffalo Railway Company is a model of neatness, and the care displayed in all parts is much to the credit of the superintendent, Thomas Henning. Mr. Henning is very much pleased with the new battery and its work.

### CENTER OPENING CAR FOR LIVERPOOL.

One of the greatest novelties, especially to American eyes, for street railway use is the center opening car recently designed and built by the J. G. Brill Company for the Liverpool

ing seat in it with reversible back so that the seating capacity is only diminished by two, this seat occupies the side opposite entrance. The open compartment is 13 ft. 10 in. and the closed compartment is 12 ft. 8 in. long; the width over the posts is 6 ft. 10 in. Both the platforms are provided with electric headlights; the dashers are 40 in. high and are continuous. The entrance to the platform is through a door in the V-shaped bulkhead, which forms the end of the car.

The constructive feature in which the builder will be most interested is that found in the vestibule where the side sills have to be entirely cut off, the support being a very strong iron frame work; this is shown under the lower step. The space between the two trucks beneath the step is covered by a screen in order to prevent people from slipping under the car between the trucks. The car is interesting because it is specially designed to meet the requirements of the service where a great many difficulties were encountered; the width and length were both limited by city ordinance, and in spite of this the seating capacity has been made 36. The



CENTER OPENING CAR FOR LIVERPOOL ELECTRIC TRAMWAYS.

Electric Tramways Company. It is 33 ft. over the dashers with end platforms only 21 in. long, the ends of the car being recessed so as to give the motorman room. The idea in its construction was to make a car which should take the place of the ordinary double deck horse car used in that city. It was desired for the sake of speed to have all the passengers on one deck and at the same time it was necessary to keep the car within the length of the ordinary horse car and its team. It might therefore be called a double deck car run tandem; the open compartment being placed on the same level as the closed, and the entrance made between the two.

The windows of the open part are closed by curtains in the usual way, no sash or blinds being employed. The closed compartment does not differ materially from the ordinary street car used in this country. The inside finish of the open part is quite plain, slat seats without coverings being used, and in the roof the carlines are exposed. The closed compartment has a bird's eye maple ceiling of three ply veneer and the seats and backs are covered with Wilton carpet; the trimmings throughout are of solid bronze. The sash in this compartment are arranged to raise 4 in., a plan which is finding considerable favor abroad.

The open platform or vestibule between the two has a slid-

standing room is of course small from the American standpoint.

This type of car was really made possible by the use of the "Eureka" maximum traction trucks; these give a very short wheel base which is very necessary in England because the percentage of curves to tangents is much larger than in this country, and hence a short wheel base is a great saving of power. The important feature however is bringing the body low and so using a single step. The speed in English cities is so limited that the double deck car, though much liked, cuts the average daily mileage down to a point where only a small profit remains; this car, so low that only a single step is needed, brings the mileage up as high as is possible with the limitations.

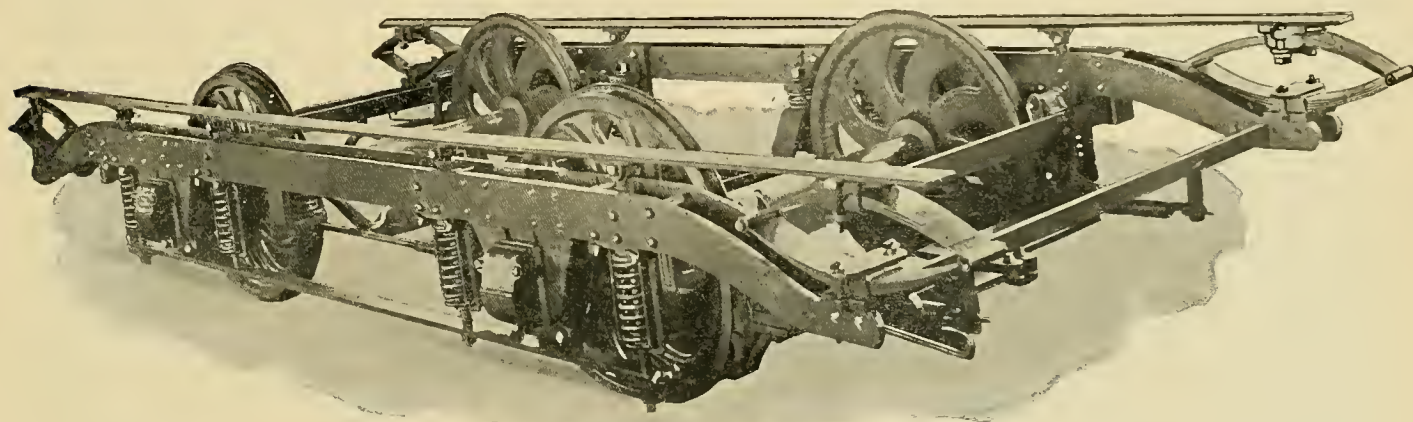
The officials of the new electric railway between Meriden, Conn., and Southington have proposed to the Meriden Electric Railroad Company that a connection be made between the two roads. President Heft has the matter under consideration. The rates of fare would be higher if the two railways operate independently but with an agreement between them it will be a great convenience to their patrons and encourage traffic.



### THE NEW DORNER TRUCKS.

The accompanying illustration shows the improved motor truck, "Criterion No. 11," made by the Dorner Truck & Manufacturing Company, of Cleveland, O. This truck has a wheel base of 7 ft. 6 in. and a spring base of 16 ft. which can, however, be changed to suit. There are half-elliptic springs over each journal box; on each side of the box are helical springs held in place by a frame suspended from the side bars; at the ends are four elliptic springs to prevent the car from oscillating.

The side bars go over the top of the journal boxes, a stronger construction than when they are bent around the boxes, and one that permits the removal of the wheels and axles in a few minutes, as when the side bars are beneath the journal it is necessary to take out all the bolts from the sill plate to remove the axles. The spring posts are so held as to give just enough side motion to take curves easily at high speed.



"CRITERION NO. 11" TRUCK, DORNER TRUCK & MANUFACTURING COMPANY.

The method of holding the helical springs is such that in case of breakage, they can be replaced by detaching the spring frame from the side bars; this is a new feature, and such repairs do not demand a pit or elevator.

To detach the truck from the car the spring posts are released from the brackets, which are riveted to the sill plate, and it is unnecessary to take out the bolts in the sill plate.

The truck is simple in design; malleable iron is used in place of cast iron; the brake is powerful, pulling on all four wheels alike. The boxes can be used either for grease or oil and a new dust guard which is very efficient is used.

### NO FREE TRANSFERS FOR ATLANTA.

Two years ago the city campaign in Atlanta, Ga., was fought on the issue of "free transfers on the street railways" and the advocates of free transfers elected their candidates. Accordingly the council passed an ordinance to the effect that after May 1, 1897, no street railway should charge more than 5 cents for a ride between any two points on its system, and should give free transfers. The Atlanta Consolidated Street Railway Company had opposed the ordinance, and after its passage the Old Colony Trust Company as trustee for the bondholders of the railway and one of the bondholders asked for an injunction against the city and the rail-

way company to prevent the enforcement of the ordinance.

The case was heard in the United States circuit court and the injunction granted in June, 1897. An appeal was taken and on May 31, 1898, the United States circuit court of appeals for the fifth circuit, affirmed the ruling of the lower court.

The city claimed the power to pass the ordinance from four sources. The claims were all disallowed, the court holding:

"1. Under the charter of the city of Atlanta there is no power given the general council and the mayor to pass and enforce the said transfer ordinance.

"2. The charters of the Atlanta Street Railway Company and the West End & Atlanta Street Railroad Company of which companies the Atlanta Consolidated Street Railway Company has become the purchaser and successor, do not make the rates of fare on the Atlanta Consolidated Street Railway Company's lines subject to the initial control of the mayor and general council of the city of Atlanta.

"3. The statute of the state of Georgia (Georgia Laws, 1890-91, Vol. 1, page 169) ratifying and confirming the incorporation of

street and suburban railroad companies, or any other acts of like nature, to which our attention has been called, do not give the right of regulating and fixing fares and transfer of street railways in the city of Atlanta.

"4. Under the constitution of the state of Georgia, which prohibits any street railway company from building upon the streets of a city, without its consent, and under the reservations made by the city of Atlanta in its ordinances granting such consent to the Atlanta Consolidated Street Railway Company, the power is not reserved to the city of Atlanta to pass any ordinance which it sees fit to compelling the Atlanta Consolidated Street Railway Company to give transfers and issue transfer tickets between the several lines of said company. These conclusions, and the reasons for which are found in the opinions of the circuit court on the demurrage disposes of this appeal. The decree of the circuit court appealed from is affirmed."

### OF INTEREST TO TRUST COMPANIES.

The supreme court of Illinois has affirmed the decision of the lower court in the case of the Lake Street Elevated Railroad, of Chicago, against the Farmers' Loan & Trust Company, of New York. This suit was brought to enjoin the latter company from foreclosing a mortgage for \$7,475,000. The holding is that the Farmers' Loan & Trust Company was not competent to serve as trustee because it failed to deposit \$200,000 with the state auditor of Illinois as required by law. This ruling is one which may affect all foreign trust companies doing business in this state.

## PERSONAL.

Joel Hurt, of Atlanta, is a candidate for alderman in Lis ward.

J. T. Funk on July 1 entered upon his duties as superintendent of the Louisville Street Railway.

C. W. Smith, president of the Los Angeles & Pasadena Electric Railway, has lately returned from an extended eastern trip.

H. R. Gowdy, recently of the Suburban, Unionville, Conn., is now chief engineer of the Meridan & Southington interurban.

William Ginnavan, for 15 years with one of the Baltimore lines, has become superintendent of the Red Bank (N. J.) electric railway.

John C. Dolph, of New York, eastern agent for the Forest City Electric Company, was married June 8, to Miss Rena Dickerson, of Brooklyn.

P. T. Corliss has been elected secretary of the Camden & Suburban Railway Company, Camden, to fill the vacancy caused by the death of Mr. Hall.

A. O. Kittredge, editor of "Accounties," New York, favored us with a call. He came to Chicago to deliver an address before a local association of accountants.

Charles S. Butts has charge of a surveying party on steam road work, and has headquarters at Ishpeming, Mich. He will return to street railway work in the fall.

W. E. Case, of Binghamton, N. Y., has been appointed superintendent of the Waverly Electric Light & Power Company in the place of G. N. Tidd, who has resigned.

George C. Ewing, who has been in the street railway supply business with offices at 8 Oliver street, Boston, is a sergeant in Company F, First Volunteer Engineer, U. S. A.

William E. Ham, secretary of the Nassau Electric Railroad, Brooklyn, recently entertained a party of 50 friends with a special trolley car ride, and at the Knickerbocker Field Club.

Edwin Warner, of Nashville, on June 25, succeeded Edward Lilly as secretary of the Chattanooga Electric Railway. Mr. Lilly resigned to become auditor of the Chattanooga Rapid Transit Company.

A. Langstaff Johnston, the well known consulting electrical engineer, of Richmond, Va., who is now completing the construction work at Mendota, Pa., was a REVIEW caller during his visit to Chicago last week.

William S. Prayton, of the New York office of the General Electric Company, was married on May 3, last, to Miss Alice Wait, of Ithaca, N. Y. Mr. Prayton is a Cornell man and passed through the Schenectady works before entering the New York office.

Henry C. Benaugh has been appointed superintendent of the Savannah (Ga.), Thunderbolt & Isle of Hope Railway. On leaving the Nashville Street Railway, where he has been for ten years, Mr. Benaugh was presented with a gold watch and chain by the employes.

B. L. Dickinson, superintendent of the Worcester (Mass.) & Marlborough Street Railway, was recently called out of bed to attend to a breakdown at the power house; when he arrived he found the employes of the company, who presented him with a watch and charm.

Wm. O. Hands, recently superintendent, and C. W. Mills, electrician of the Northeast Street Railway, Kansas City, have resigned to take Ohio and eastern states territory for a newly invented gasoline lamp specially suited for park illumination. They called on the REVIEW while en route to Cleveland.

George F. Chapman has been made general superintendent of North Jersey Street Railway Company. Mr. Chapman was formerly superintendent of the Elizabeth branch of the Consolidated Traction Company, of Jersey City, now leased by the North Jersey, and is succeeded in that office by James Smith, of Orange.

John J. Fitzpatrick, who for the past seven years was connected with the late Judge Grinnell, general counsel for the Chicago City Railway, has resigned to engage in the practice of law on his own account, a step he has contemplated for some time. His many friends will wish for him, and expect, a successful and brilliant career.

Capt. J. T. Jones and family, of Buffalo, have gone to Germany for a four months' visit. Captain Jones is president of the Niagara Falls & Suspension Bridge Street Railway Company. Last year he sought relief in Europe for heart trouble, and was so affected that he has returned for continued treatment. His numerous friends will wish him a full realization of all his hopes.

J. O. Haddox has resigned his position as superintendent of the Louisville Railway Company, of Louisville, Ky. Mr. Haddox has been connected with the above company for the past sixteen years, rising from the position of office boy to that of general superintendent. He is a young man of marked ability in street railway management, having a practical knowledge of all its different branches, and it is only a matter of a short time until he is identified with some one of the large street railway systems of the country.

## NEW PUBLICATIONS.

The June issue of the "Canadian Electrical News," of Toronto, was a special number, attention being given to the electrical features of Montreal where the eighth annual convention of the Canadian Electrical Association was held June 28, 29 and 30. The Cataract Power Company's works were illustrated and described, a map showing the lines and offices of the Bell Telephone Company in Canada was given, portraits were shown of prominent electrical men including two street railway managers, which together with the other contents illustrated the rapid developments of electricity in Canada.

The street railway guide to Eastern Massachusetts and Rhode Island, published by Robert H. Derrah who has been connected with the West End Street Railway Company for the past nine years, is the most complete of any like publication which comes to our notice. It contains a map showing 1,368 miles of electric railway and in addition gives complete tables of routes, rates of fare, distances, etc. The edition for '98 has 160 pages of reading matter describing all the principal points of interest along the lines of the railways, illustrated by 90 half-tone cuts. For anyone desiring to take business or pleasure trips through the many cities and towns in this section the guide will be a great help. Price 15 cents.

We have received "American Street Railway Investments," the financial supplement of the "Street Railway Journal," and commonly known as the "Street Railway Red Book" for 1898. This is fully up to the high standard of previous years and gives the data for 1897; most of the reports bear the date of April, 1898. On pages 1 and 2 are tabulated the gross receipts of 175 of the principal companies for the last two years; the companies are in five groups according to their gross earnings. From these tables it appears that the street railways of the country have just about held their own in 1897. The operating statistics and balance sheets are presented in tabular form and the returns for previous years given so that reference to previous additions are not necessary to make comparisons.

The earnings of the Montreal Street Railway Company show a very creditable increase over those of a corresponding time last year. For eight months preceding June 1 the receipts were \$902,000 or \$80,680 more than eight months of the preceding year.



**THE UNCONSCIOUS OWNERSHIP OF AN IMPORTANT KEY.**

**A Plea for the Introduction of Goods Traffic on Our Suburban Tramways.**

Abstract of a Paper read before the Canadian Electrical Association, by  
W. T. Bonner, Montreal.

The first consideration in exploiting any new suburban tramway is the possible or available passenger traffic. That being found inadequate to guarantee a fair return on the cost of installation and maintenance, the project is usually abandoned for the reason that only passenger traffic can be considered, owing to the high cost of handling goods traffic at the terminals. While a motorman and conductor are sufficient to handle a two or three-car electric train for passenger traffic, with very little expenditure of time or assistance for loading and unloading, all railways under present systems require a large additional force to conduct the hundreds of details attending the reception, checking, loading, transferring, unloading and proper delivery, in good order, of either car lot or package freight.

It is not the railway investors alone who suffer the effects of this handicap, but the property owners also, since the latter have no recourse, while the capitalist has but to seek other more profitable fields for investment.

It may therefore be conceded that the whole subject presents two phases of commercial economy, viz.:

(a) From the standpoint of the agriculturalist and land owner; how best to provide a means for increasing the value of remote but otherwise valuable agricultural lands, and at the same time retain present value of adjacent property by converting it from market gardens into residence and manufacturing sites.

(b) From the standpoint of the capitalist and manager of railway properties; how best to increase the earning capacity of existing or proposed suburban lines.

With the ever increasing centralization of population and commerce, inaccessible property becomes less valuable; all land, whether barren or fertile, suffering alike, according to its distance from the centre of demand for farm products, which we call markets. Such distance is not always measured in actual miles, but rather in accessibility, since in our day we find frequent examples of the paradoxical long and short haul rates. The Minnesota and Manitoba farmers will deliver their wheat at the seaboard at a lower cost per bushel than the farmer who may live a hundred miles off the coast. The eastern farmer may have just as fertile land as his western competitor, but he is handicapped by having to haul his wheat 40 or 50 miles over poor wagon roads to reach the nearest railroad.

In either case, the terminal charges, including the cost of loading the produce at the farm, is approximately the same, but the difference in cost of haulage per ton-mile by railroad and wagon road is so tremendously in favor of the former that without such facilities the farmer may as well retire from business. It has been stated as a fact that to transport a ton of coal from Buffalo to Chicago costs no more than to move the same quantity of coal across the sidewalk in either city.

While railroads have changed the character of suburban passenger traffic, they can never entirely supersede the common road for freight, since every ton carried by them must be delivered over a highway at one or both terminals.

The following table shows the results of actual observations on the cost of moving a load of one ton a distance of one mile on level roadways, with different pavements and under average conditions:

Iron Rails .....	1.28 cents per ton-mile
Asphalt .....	2.70 cents per ton-mile
Stone, paving, dry and in good order.....	5.33 cents per ton-mile
Stone, paving, ordinary condition.....	12.00 cents per ton-mile
Stone, paving, covered with mud.....	21.30 cents per ton-mile
Broken Stone, dry and in good order....	8.00 cents per ton-mile
Broken Stone, moist and in good order...	10.30 cents per ton-mile
Broken Stone, ordinary condition.....	11.90 cents per ton-mile
Broken Stone, covered with mud.....	14.30 cents per ton-mile
Broken Stone, ruts and mud.....	26.00 cents per ton-mile
Earth, dry and hard.....	18.00 cents per ton-mile

Earth, ruts and mud.....	39.00 cents per ton-mile
Gravel, loose .....	51.60 cents per ton-mile
Gravel, compacted .....	42.80 cents per ton-mile
Plank, good condition.....	8.80 cents per ton-mile
Sand, wet .....	32.60 cents per ton-mile
Sand, dry .....	64.00 cents per ton-mile

On rough roads the load a horse can draw is much diminished—it is estimated that while a horse can pull 6,270 lbs. on a level track, on a 10 per cent grade he can draw but 1,630 lbs.

From the table and statistics gathered by official bureaus it is calculated that the average cost of transportation by animal power is 25 cents per ton-mile and where such a high rate exists, land must diminish in value. A forcible illustration is the fact that a Long Island farmer, 50 miles from New York city, where potatoes were jobbing at 80 cents to one dollar per bushel, was recently obliged to sacrifice his entire crop, because it would not pay to haul it to market.

The measure of benefit which any improvement in production in one community bears to another community, depends entirely upon the transportation facilities between the two places. Recently a customer came into our office from one of the interior mining districts. We estimated the plant he required would cost \$1,255. To help him out all we could, we eliminated every possible item not absolutely essential to the proper working of the plant, and allowing also for erector not being required, we found we could reduce our price 10 per cent, making the net total \$1,130. But how insignificant our discount appeared when we learned the freight from Montreal to the mine would cost \$1,248, notwith-

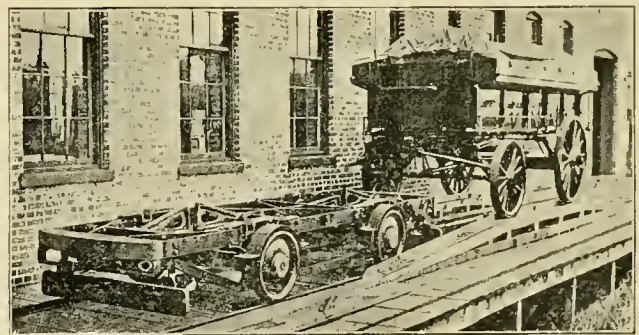


FIG. 1.—BONNER RAIL WAGGON.

standing no part of the route required mule-back transportation. Although farther distant from Montreal, the same plant could be transported to Vancouver for less than \$250.

Concentration of population and production requires for the better equalization of supply, and price of materials and provisions, that such centres must be provided with commercial veins and arteries which shall quickly and cheaply transport or exchange urban and suburban passengers and commodities. While long haul rates of transportation by railroads and steamships have been wonderfully cheapened, there still remains a space of fifteen to twenty-five or even forty or fifty miles surrounding every commercial centre, which has never been covered by any cheap method of transportation. Such distances are beyond the possibility of cheap or efficient service by animal power, and the terminal charges and bulky plant required, preclude any possibility of much reduction in railroad tariffs. What we require, therefore, is a new system of transportation which shall be alike available for freight and passengers.

In 1894 the writer promoted a scheme for uniting one of the large commercial centres on Lake Erie with several surrounding counties by a system of electric railways which would combine both freight and passenger traffic. The arrangement was such that the farmers anywhere along the line would secure the immediate benefit of the higher city market rates for their produce, as well as competitive selection and prices for supplies. Local and sub-stations were to be established at frequent points along the line where the farmers could deposit their produce to be forwarded by next train to a central clearing house in the city from whence it could be delivered at once to the consumer. The scheme

was to be co-operative in a measure, the subscribers to receive the first benefits. Telephone connection was to be established between the city and farm residences through the company's local stations, and direct orders for goods from the city merchant could be received by wire and despatched by next train out. Only samples, or a very limited supply of staple goods, were to be kept at the local stations, the principal stock to be maintained at the central clearing house, and by the various city merchants who belonged to the syndicate. Electric current for light and power was also to be supplied to consumers along the line. In short it was proposed to so unite city and country by wire and rail that all would enjoy equal facilities for obtaining supplies.

Unfortunately the financial depression of that year so handicapped our efforts that we were unable to carry out the project, but those who gave the subject most careful consideration at the time still expect to see some such system as the above in general use.

The latest development in the line of providing for goods traffic on electric tramways came to the writer's notice some months ago in the shape of a combination vehicle, so constructed as to be readily convertible for use upon any ordinary roadway or upon a railroad track. It can be shifted from one to the other at will, without the necessity of reloading or rehandling the contents between points of shipment and destination. The idea is not altogether new, but the application will no doubt impress you all as novel in the extreme.

Notwithstanding the similarity of names the writer begs to disclaim any connection with the introduction of this scheme, but

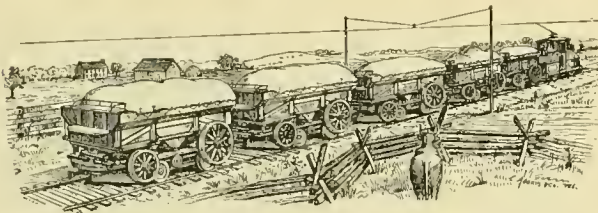


FIG. 2.

nevertheless the principle involved certainly commands attention.

The Bonner Rail Wagon Company, organized about a year ago, states in its prospectus that it will build rail wagons and operate them through leases or franchises granted to interurban electric railroads. It is proposed that such roads shall be equipped with any stipulated number of rail wagons, thus enabling them to supply patrons at any point along their lines, or at the terminal stations.

Figure 1 illustrates the integral parts of the combination vehicle. The wagon proper is patterned after the ordinary improved road wagon, modified, of course, for the special nature of the service contemplated. The running gears and springs are of standard construction, having a carrying capacity of from three to seven tons, depending upon the class of freight to be carried.

The rail truck is not materially different from the car truck in general use upon our electric railways, except that it is provided with special attachments for automatically gripping and supporting the wagon proper. The truck is exceedingly simple in design and very light in proportion to its strength, being constructed entirely of wrought iron and cast steel.

Figure 2 illustrates a train of five wagons drawn by a familiar-looking electric locomotive en route across the country.

Such a system as this would at once render accessible endless acres of fertile interior lands, and open them up to the systematic energy of the thrifty market gardener, the dairyman and the fruit grower. Improved conditions would result to the truck farmer, who would no longer be obliged to spend his night in long weary drives in order to reach the early market. Instead, his day's harvest would be transported to town during the night by electric rail wagon while man and horse refresh themselves in sleep.

Thus would we increase the market value of distant agricultural lands, and at the same time retain present values of nearby property. With the increase of land values and production, must also come increased traffic for existing or proposed suburban railways.

## WIND STORM AT CINCINNATI.

On June 24, a severe wind storm swept over the Ohio valley doing much damage in Cincinnati and the vicinity.



CAR BARN DAMAGED BY WIND STORM.

Among the buildings damaged was the car barn of the Cincinnati, Newport & Covington Street Railway, a portion of the roof being carried away as shown in the accompanying illustration.

## THE DUPLEX CAR.

One of the interesting exhibits at the coming convention at Boston will be a car so made as to allow the sections to slide into the roof much the same as a roll top desk. It combines a perfect winter and summer car in one and can be opened and closed at will to suit all conditions or sudden changes of weather. The Duplex Car Company, which has its offices in the Postal Telegraph Building, New York, has been perfecting this type and now has manufacturing arrangements which ensure prompt deliveries. Such cars in taking the place of two equipments, effect a great saving in first cost, maintenance of car bodies, motors, trucks and appliances as well as simplifying the question of storage and insurance. Such a car when placed on the track would be suitable for service the year around. While it is an advantage to the company it also adds to the comfort and convenience of the passengers who can raise and lower the panels at will.

During the past year or two the cars have been put through some severe tests on several New York and New England roads with entire success. The strength and durability of the car can not be doubted as these have stood the service as well as the other cars. This type can be made even more substantial than the standard car. The posts are in one piece curved from sill to sill, thus dispensing with the joint at the roof.

## FENDERS FOR CHICAGO AND WASHINGTON.

The Chicago city council which a few months ago passed a fender ordinance which failed to stick, has again tried its hand and passed an order for the equipment of all cars with basket fenders by September 1.

In Washington, D. C., the District Commissioners have changed the police regulations and making a ten dollar fine the penalty of any motorman or conductor running a fenderless car.



**OBITUARY.**

M. W. Squiers, who was one of the pioneers of Chicago and superintendent of the North Chicago Street Railroad Company early in its history, died in this city June 20. He was 66 years old and leaves a widow, two daughters and three sons.

Captain John A. Williamson, one of the pioneer street railway men in Cincinnati and the Kentucky cities across the river, died at his residence on July 8, in Newport, where he has lived since 1833. He was born at Portsmouth, O., July 9, 1826, and was a pilot on the river when a young man. He was afterwards the owner of the Cincinnati and Newport ferry and was president of the company which constructed the Newport bridge. He operated the horse car lines between Cincinnati and Newport for twenty years and negotiated the consolidation of all the lines on the Kentucky side of the river.

**NEW LINE BETWEEN MINNEAPOLIS AND ST. PAUL.**

The first trip on the Como interurban line was made on July 1 by Thomas Lowry, president of the Twin City Rapid Transit Company, Vice-president C. G. Goodrich, General Manager W. J. Hield and a party of 20 which started from Minneapolis in a special car. Leaving Como Park station the line skirts the south end of the park and then passes directly through it and on Langford avenue to the fair grounds. From this point until the old county road is reached Langford avenue is followed. The line passes within a short distance of the experimental station, through St. Anthony Park and then on the county road until it reaches and connects with the line in Minneapolis known as the Como and Kenwood. The scenery along the line is picturesque and it is expected that the attractions at Como Park will draw large numbers of visitors.

**FREIGHT ON TROLLEY CARS IN PITTSBURG.**

The committee on corporations of the Pittsburg council has reported favorable on ordinances granting to the Pittsburg, Oakland & East Liberty, the Citizens' Passenger Railway and the Central Traction companies, all leased roads operated by the Consolidated Traction Company, the right to carry packages, produce and freight. No more than 50 freight cars can be operated on each line and no car can be stopped at one point longer than five minutes. The charters of these three companies are the oldest in the city and are the only ones which provide for such privileges. The scheme if carried out will be a boon to many business houses and those living in outlying districts and will in no way interfere with the rapid transit of passengers.

**PRIVATE RIGHT OF WAY FOR WISCONSIN ROAD.**

The promoters of the electric line to be built connecting Oshkosh, Omro and Berlin, Wis., have asked for franchises from the towns of Algoma, Omro, Rushford, Nepeskun and Berlin and are trying to secure from the farmers a strip of land 15 ft. wide through their property. It is believed that this will be readily granted as the electric line will greatly enhance the value of property besides furnishing splendid transportation facilities to that locality.

**SPECIAL LAKE SHORE TRAIN TO CONVENTION.**

The Lake Shore & Michigan Southern Railway proposes to run a special train from Chicago to Boston to accommodate western delegates to the Street Railway Convention, which opens Tuesday morning, September 6, and lasts four days. The leaving time is set for 10.20 a. m. Sunday, September 24, which will bring the train into Boston early Monday afternoon, in ample time to get settled at hotels before evening. The train service for this trip will be the finest sleeping, dining and buffet cars, and every possible comfort will be provided for. Delegates from Ohio and southern points will join the party at Cleveland, and others at Buffalo and Albany. The route will be over those famous lines, the Lake Shore, New York Central, and Boston & Albany, than which there are no finer in the world.

Passengers coming over the Big Four will have their through sleepers attached at Cleveland. The party promises to be a large one, and special pains will be taken to make the trip a highly enjoyable one. The full details will be announced in the August REVIEW, and in circulars which will be sent out by the Lake Shore officials in a few days.

**CHICAGO CITY RAILWAY'S BIG CAR ORDER.**

President Bowen, of the Chicago City Railway, has given an order to D. W. Pugh, representing the Stephenson Company, for 100 closed cars 20 ft. body. The interior finish will be cherry. Both ends will be vestibuled, with doors. The McGuire truck will be placed under 65 cars, and the remainder mounted on the new truck invented by Master Mechanic Moore. The motor equipment will be Westinghouse, the order having been secured by Maurice Coster, Chicago manager. Columbian heaters will be placed in each car.

**ELECTRICITY ON THE CONSOLIDATED.**

It is stated that President Clark, of the Consolidated Railroad, has given orders that the plans and work on the Warren and Bristol branch for operating it by electricity be pushed as rapidly as possible. Future competition from trolley lines brought about the change. Experience from the two electric lines now operated by the Consolidated Railroad will be of great value in preparing the plans. The power station will be located at Warren, R. I., and the line will extend southeast on the peninsula to Bristol and north-west to East Providence where connection will be made with the Union Railroad Company, of Providence.

**AN ARMY AND NAVY**

Memorandum book is what you have been wanting. The Northern Pacific has it. It contains cut of the Maine, Map of Cuba, List of United States and Spanish Naval Vessels, Interior Drawings of a Battle Ship, Illustrations of United States and Spanish Ships, Glossary of Navy and Army Words, Table of Distances, Commanders of United States Ships and Army Corps, List of United States Regiments and Their Commanders and other information very useful and valuable at this time.

The book fits the vest pocket and is up to date. Send Chas. S. Fee, General Passenger Agent, N. P. R., St. Paul, Minn., ten cents and the book is yours.

## ECHOES FROM THE TRADE

The Jackson & Sharp Company is building a car for the Dodge Kinetic Motor Company.

The Okonite Company, New York, is sending to its friends an artistic picture handsomely framed.

H. H. Lowe, of Clinton, Mass., has the contract for the new car house of the Worcester & Clinton street railway.

J. M. Atkinson has been on a trip to New York and the east and has closed several good orders for his flexible horse shoe rail bonds.

H. N. Ransom, the New York agent of the Consolidated Car Heating Company, is taking a well earned vacation of three weeks.

The Western Gear Company, Milwaukee, is extremely busy and operating its works day and night, with a large number of orders in hand.

Orders recently received for "Chicago" bonds, made by Washburn & Moen Manufacturing Company, are quite large and come from all parts of the world.

A. C. Vosburg, of the New Process Rawhide Company, Syracuse, reports a highly satisfactory condition of business in steadily increasing orders for rawhide pinions.

The Pennsylvania & Ohio R. R. Co. has been granted a franchise by the commissioners of Lake county, to build an electric railway from Painesville to Conneaut, in Ohio.

Reports come to us that numerous street railway companies, in all parts of the country, are finding that foot cycle "academies" are highly profitable attractions for summer resorts.

The Westinghouse Electrical & Manufacturing Company has sold 76 double equipments of motors to the Cleveland Electric Street Railway Company; they are of type 49, 35 h. p.

The C. W. Hunt Company, New York, has issued two handsomely illustrated catalogs describing the Hunt cable and the Hunt automatic railway for handling coal, merchandise, etc.

The Duplex Car Company formerly at 147 Franklin street, Boston, has opened an office at 253 Broadway, New York, which is in charge of W. B. Crittenden, vice-president of the company.

Frank A. Lapham, general sales agent of the Cleveland Frog & Crossing Company, was in New York during the last week in June and was successful in getting a very large order for special work.

Mayer & Englund, Philadelphia, have been appointed agents for the American Rail Joint Company in the territory comprising New Jersey, Pennsylvania, Maryland, Virginia and the District of Columbia.

J. A. Hanna, of Chicago, western agent for the Peckham Company, spent several days in New York recently. From the sales made it is evident the Peckham trucks are as popular in the west as in the east.

The American Rail Joint and Manufacturing Company, of Cleveland, O., has appointed Wendell & Macduffie, 26 Cortlandt street, New York, and 53 State street, Boston, its agents for New York and New England.

J. W. Gardner, recently connected with the Stirling Boiler Company, and for a long time western manager for Manning, Maxwell & Moore, has accepted a position with the sales department of the Sargent Company.

Elmer P. Morris, 15 Cortlandt street, New York, reports an increase in both home and foreign trade. The extension of the foreign business necessitated the services of a correspondent who is familiar with several languages.

John High, selling agent for the Pantasote Company, spent two weeks at Saratoga where the conventions of the Master Mechanics' and the Master Car Builders' Associations were held, and secured several large curtain orders.

W. D. Sargent, president of the American Brake Shoe Company, sailed on the Britannic, July 6, for Europe, to make arrangements for the manufacture of the "Diamond S" brake shoes in several European countries, including Russia.

A. S. Littlefield, president of the North American Railway Construction Company, Chicago, reports closing contracts with the Metropolitan Railway, of Kansas City, for the construction of one mile of double track, and 6,000 cast welded rail joints.

By reason of the extreme rush of business John A. Brill, of the J. G. Brill Company, is so closely confined that he is unable to serve as a director of the General Electrical Automobile Company, as was generally given out at the starting of that organization.

The Sargent Company announces the largest month's business in patented brake shoes in the history of the company, for June, 1898. It is extremely busy in the steel department and running to the full capacity, with prospects of heavy business throughout the year.

The latest catalog from the Walker Company is one entitled "Some Lighting Plants," describing briefly and illustrating by half tones some of the fine isolated lighting installations of that company in hotels and office buildings in New York, Cleveland and elsewhere.

An extremely interesting and attractive booklet is "Electrical Expertism," by an expert. Forée Baiñ, Monadnock building, Chicago, is the expert and in this book he points out a few of the reasons why one about to install an electric plant should consult an engineer.

The General Electric Company will have an exhibit at the Twentieth Triennial Exhibition of the Massachusetts Charitable Mechanic Association in October. This, it will be remembered, is to be in the hall where the American Street Railway Association holds its conventions.

The Patton Motor Company, 340 Dearborn street, Chicago, has issued an illustrated catalog describing the application of the Patton electric motor system to suburban and interurban railways. Some interesting data are given, taken from severe tests and with the motors in service.

In abstracting the proceedings of the Municipal Electrical Association (England) the "Electrical Review," London, says: "The nearest approach to a satisfactory rail joint is the Falk joint, and it does not seem improbable that a cast joint of this type will, sooner or later, come into general use in England."

Business is very brisk with the Sterling Supply & Manufac-



**MAYER & ENGLUND,**  
**10 SOUTH TENTH ST. PHILADELPHIA, PA.**

**Electric Railway Material and Supplies**  
**OF EVERY DESCRIPTION.**

*We carry a Large and Complete Stock of Everything needed for the Construction,  
 Equipment and Maintenance of Electric Railroads.*

**HIGHEST CLASS MATERIAL AT LOWEST PRICES.**

**NUTTALL GEARS, PINIONS AND BEARINGS.**  
**UNION STANDARD TROLLEYS AND PARTS.**  
**PARTRIDGE SELF-LUBRICATING CARBONS.**  
**INTERNATIONAL REGISTERS AND REGISTER FITTINGS.**  
**VAN WAGONER & WILLIAMS CO. COMMUTATOR SEGMENTS.**  
**COMMUTATORS REFILLED. ASSEMBLED BARS AND MICA.**  
**ELECTRIC HEADLIGHTS. ELECTRIC CAR HEATERS.**  
**MOTOR AND CONTROLLER REPAIRS, ALL KINDS.**

**STANDARD OVERHEAD MATERIAL.**

**Prompt Shipments from Stock. Send for Catalogues.**

turing Company, several large consignments of registers having been made, and orders are booked for overhead material. The secretary, Mr. Tiffany, and two of the office force, have enlisted in the army, which throws a great deal of work on Mr. Carson.

The Jackson & Sharp Company, Wilmington, Del., is completing an order of nine-bench open motor cars for the New Castle (Pa.) Traction Company, and an order of double truck closed cars for the Sea View Railway Company at Narragansett Pier, R. I. Twenty double-deck cars have recently been shipped to South America.

The Peckham new "extra heavy double trucks" have recently gone into service on the following roads: Cleveland, Berea, Elyria & Oberlin Street Railway, Cleveland; Dayton & Western Traction Company; St. Louis & Belleville Suburban; and Omaha & Council Bluffs. From each of these roads reports come of excellent service and perfect satisfaction.

The Baltimore Consolidated Railway Company, on June 23, ordered 150 cars to replace those burned in the fire at Irvington. The contract for 75 convertible cars went to the J. G. Brill Company, Philadelphia. The Brownell Car Company, of St. Louis, is to build 75 closed cars. The Baltimore Car Wheel Company furnishes all the wheels, and the Westinghouse Company the motors.

The Toledo Traction Company has recently ordered of the Barney & Smith Car Company 14 closed cars for September delivery; they have 20-ft. bodies, vestibuled at the front end and with rear platforms 4 ft. 6 in. long. They will be fitted with Columbia stoves. The company has also ordered 10 trucks of the McGuire Manufacturing Company and 16 fare registers of the Sterling Supply & Manufacturing Company.

G. E. Pratt has been appointed representative of the Ajax Metal Company, Philadelphia, manufacturer of journal bearings, trolley wheels, harps and electric metal supplies, and has taken in con-

nection therewith the agencies of the Forsyth Brothers Company, of Chicago, maker of car curtains and fixtures, and the Jackson & Sharp Company, Wilmington, Del. Mr. Pratt's office is room 1103, Betz building, Philadelphia.

The Ball Engine Company, Erie, Pa., has issued a new catalog (11) descriptive of its automatic cut-off engines for electric lighting, electric railway and general manufacturing plants, which comprise simple and tandem and cross compound horizontal engines and simple and compound vertical engines. Both direct-connected and belt driven units are shown. The pamphlet has 40 pages and is typographically perfect.

The Crane Company, of Chicago, through G. A. Hurd, has lately closed contracts for piping and valves from the Bluff City Electric Railway Company, Chicago, and the Indianapolis Electric Light & Power Company; it also has orders from the North American Chemical Company, Bay City, Mich.; the Imperial Electric Light Company, St. Louis; the Deering Harvester Company, Chicago; Hegeler Zinc Company, La Salle, Ill., and others.

W. S. Cleveland, manager of "W. S. Cleveland's Greater Massive Minstrelsy" and "George Wilson's Model Minstrelsy of the World," was obliged to refuse a very flattering offer for a month's engagement of these two shows (the latter half of July and the first half of August) at the Willow Grove Park of the Union Traction Company, Philadelphia, because his season does not open until August 1, and the August contracts are all closed.

The Walker Company, on account of rush of work and consequent need of additional space, has found it necessary to add to the large machine shops it already possesses at the Cleveland works. These machine shops alone consist of three bays each 400 ft. long and the addition will consist of a fourth bay. Work is being rapidly pushed and the new bay will be shortly completed and ready to receive the large machine tools which are to be placed there.

Eugene Munsell & Co., of 117-119 Lake street, Chicago, are sending to their western customers a very neat blotter, on which are embossed the Cuban and American flags, under which are the words, "Victorious on Sea and Land." The printed matter beneath these words refers to the rapid development of a great business in a great city and that they don't need any better advertisement as to the superiority of their "Mica" or service rendered.

The Babcock & Wilcox Company reports sales for the first six months of 1898 as greatly in excess of first 10 months of 1897. A notable order which it is now filling is that for the 96th street power station of the Metropolitan Street Railway Company, New York. This order for 15,000 h. p. of wrought steel type boilers is the largest stationary boiler order ever placed. Previous sales to the Metropolitan Company amount to 7,500 h. p. Sales to electrical industries in 1898 to this date aggregate 37,511 h. p.

The Calumet Electric Street Railway Company of Chicago, is replacing the 11 Detroit dynamos in its power station with four 250-k. w. Walker generators. These will be belted to four cross compound condensing Buckeye engines which have been driving the old dynamos. The new machines, together with the General Electric 800-k. w. direct connected unit, will give ample power for the heavy summer traffic. The switchboard will be reconstructed and a General Electric 5,000-ampere recording wattmeter will be placed on the station panel.

The Charles Munson Belting Company has taken the entire ground floor at 22 to 36 Canal street, Chicago, in addition to the upper doors, which it has occupied for a number of years. The Chicago house is under the management of the secretary, A. E. Grotzinger. The electrical and railway departments are in charge of Col. J. H. Shay, who has a very extensive acquaintance among the trade. Among recent sales are two 60-in. belts to the United Electric Company of Washington, D. C., and one 60-in. belt to the street railway at Danville, Ill.

The Goubert Manufacturing Company, 14 and 16 Church street, New York, has secured from the Metropolitan Street Railway Company, of that city, the contract for feed water heaters for the mammoth power station being erected at 96th street and East river. The first installment consists of 30,000 h. p. in six heaters, horizontal type, and rated at 5,000 h. p. each. They are to be placed between the low pressure cylinders and the condensers. This is said to be the largest single order for feed water heaters ever placed in this or any other country.

Frank C. Randall, eastern selling agent for the Christensen Engineering Company, has obtained some very good orders for air brakes. Among others may be mentioned one from the Lowell, Lawrence & Haverhill Street Railway Company, the brakes to be used on the suburban cars running between Lowell and Lawrence and Lowell and Haverhill; one for the equipment of the suburban cars of the Brockton & Taunton Street Railway Company, and additional orders for the electric cars on the three divisions of the New York, New Haven & Hartford Railroad.

There has been a growing demand among belt users for a more convenient form of belt dressing than the paste. The Joseph Dixon Crucible Company, Jersey City N. J., is now placing on the market a solid belt dressing in round bars, about 8 in. long and 2 in. in diameter. It makes a package convenient to the hand, and easy to apply even to fast running belts. The company does not claim that the solid dressing is as good a preservative of the life and elasticity of the leather as the Dixon paste, but it is quick to apply and quick to act, and that is what is wanted by the general run of belt users.

The Billings & Spencer Company, of Hartford, Conn., has published a new list of drop-forged lake copper commutator segments for all standard sizes of street railway motors. Full sized cuts representing the form and dimensions of all the standard commutator segments for T. H. Edison, General Electric, Westinghouse, Walker, Steel, Short, Rae and Ganz street railway motors are given. The number of divisions, the angle of segment, the

weight of single segment, the chord for 1 in. radius are printed on each cut. The catalog is complete and will be of value to every street railway electrician.

The annual meeting of the stockholders of the Siemens & Halske Electric Company of America was held on June 16 at its offices, Monadnock block, Chicago. Nearly the entire capital of the company was represented at the meeting and the following gentlemen were elected directors of the company: Chas. T. Yerkes, Martin Maloney, John R. Bartlett, R. Suydam Grant, Charles E. Yerkes, E. A. Moore, B. W. Grist, Howland Coit, W. L. Elkins, Jr. The new board of directors was organized and the following gentlemen were elected officers of the company: Chas. E. Yerkes, president; W. T. Block, secretary and treasurer; C. F. Marlow, assistant secretary and assistant treasurer; B. W. Grist, general manager; Martin Maloney, Chas. E. Yerkes, J. R. Bartlett, executive committee.

In the "Series-Parallel Controller Case," decided in favor of the General Electric and Westinghouse Companies in the United States circuit court for the district of Connecticut, Judge Townsend, on June 13, denied a motion for a rehearing, and on June 16 entered a decree for an injunction to prevent further infringement of certain of the claims, and an order for an accounting; as to certain other claims, not infringed, the bill was dismissed. In the "Electric Railway Motor Suspension Case," an injunction against the Nassau Electric Railroad was ordered June 29, in the United States circuit court for the eastern district of New York, the opinion in favor of the General Electric and Westinghouse companies having been handed down in the court of appeals, May 17.

The directors of the General Electric Company, at their recent meeting, voted to recommend to the stockholders a reduction in the share capital of the company, both common and preferred, of 40 per cent. This settlement, while satisfactory to the common stockholders, is regarded as particularly favorable to the preferred shareholders, inasmuch as it will render unnecessary the taking of any steps for the liquidation of the company, in which event the preferred stockholders would receive only the same amount as the common stockholders, and no back dividends. The plan now adopted contemplates the payment from the surplus earnings of the company as they are hereafter made, of the accrued dividends in the preferred stock.

On the new basis \$1,275,000 will be required annually to pay 7 per cent upon the preferred and 6 per cent upon the common stock. The stockholders' meeting will be held at Schenectady, August 16, at noon.

## IF YOU LEAVE HOME

For the summer, go where you will find, almost literally, a new world. Such a spot is Yellowstone Park. There is no place like it in the South, nor elsewhere. You will be astonished at what you see and learn there. A month's outing in those mountains, 7,000 feet above the sea level, in an atmosphere pure and invigorating, would add years to your life. There are four modern hotels, good roads—maintained by the U. S. Government—for riding, driving or cycling; riding horses and pack trains. Geysers, canyons, mud springs, lakes, cataracts and cascades in large number, are crowded into a space 54 by 62 miles in size. If you can afford it, you wrong yourself by not going there. If you cannot afford it, then go to beautiful Leech Lake in Minnesota, a new and popular resort. New hotels, fine fishing and hunting, and good boating at reasonable rates. Send Chas. S. Fee of Northern Pacific Railway, St. Paul, Minn., six cents for Wonderland '98 that describes by pen and picture both resorts. Mention where advertisement was seen.

A serious collision occurred between two trolley cars on the single line of the interurban between Corapolis and Carnegie, Pa., due to the failure of a signal lamp to work. The motorman of one of the cars was severely though not fatally injured and five of the passengers were more or less hurt.



**HALE FARES**

**Interesting Bits of Information from all Parts of the Country,  
Boiled Down for Busy Readers.**

A new ordinance to give the Milwaukee, Racine & Kenosha Electric Railway a franchise is now pending in the Kenosha council.

The Wheeling (W. Va.) & Elm Grove Railroad Company has nearly completed its line from the eastern limits of the city to Wheeling park.

The Janesville (Wis.) Street Railway reports that the receipts for June exceeded those of any previous June under the present management.

In the appeal of the Toronto Railway Company, the supreme court decided that the rails, wires and poles are immovable property and taxable.

The rate payers of Hamilton, Ont. will vote July 27 on the question of whether the city purchase the street railway or extend the franchise for 15 years.

A St. Louis hook and ladder truck dashed into a trail car of the Broadway cable seriously injuring one passenger, injuring five firemen and damaging the car and truck.

July 5, Judge Grosscup of the United States circuit court refused to enjoin the city from cutting the wires of the Chicago General Railway supplying motive power to customers.

The Union Traction Company, Philadelphia, has elaborately decorated one of its cars with red, white and blue lamps; this car is a special run on Saturday and Sunday evenings.

The Syracuse, Skaneateles & Moravia Electric Railway Company has petitioned the trustees of the village of Solway for a franchise to construct the line through the village on a private right of way.

The Sidney-Franklin, N. Y., electric road was sold by the receiver to Robert Cartwright for \$225, the property being subject to a judgment of \$202, a mortgage of \$1,000 and several mechanics' liens.

A car on the branch line of the Akron (O.) Street Railway & Illuminating Company running to Silver lake, jumped the track at a curve and went over an embankment severely injuring six passengers.

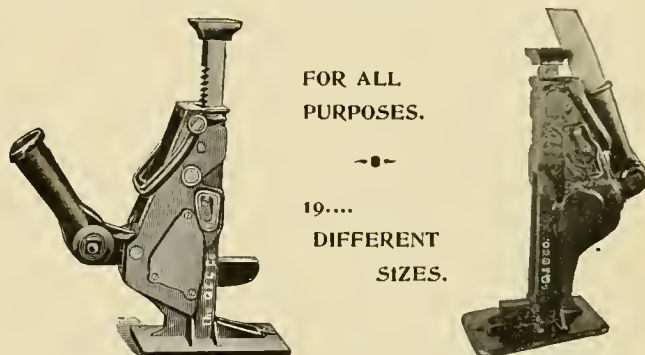
The Lincoln (Ill.) Street Railway Company will put in a dynamo at the power plant for the exclusive purpose of running fans as it is said that insurance companies object to fans being run by the trolley current.

The receivers of the Union Street Railway, Saginaw, Mich., have petitioned the court for permission to issue \$15,000 worth of receiver's certificates for the purpose of rebuilding and extending the tracks.

**The Q. & C. Co.**  
**Compound Lever Jacks**

**Solid Main Frame.  
Patent Adjustable Levers.  
Quick Trip Action.**

**THEY ARE STRONG  
SAFE  
SURE**



FOR ALL  
PURPOSES.

19....  
DIFFERENT  
SIZES.

Send for Complete List, Sizes, Weights, Capacity, Prices, Etc.

**The Q. & C. Co.**  
**Self-Feeding Rail Drill**

Will Bore 7-8 in. Hole in Less than One Minute.

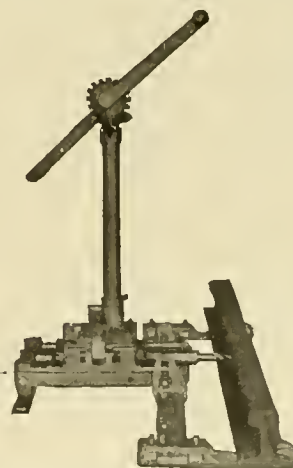
BALL  
BEARINGS.



EASY  
ACTION.



VERTICAL  
and LATERAL  
ADJUSTMENT.



DURABLE  
CONSTRUCTION.



LIGHT  
WEIGHT.



USED INSIDE  
or OUTSIDE  
of RAILS.

Furnished with Over or Under Rail Clamps, as desired. Top removed for Passing Cars in Two Seconds. Quickly readjusted for work. Get Our Catalogue and Prices before Placing Your Orders.

**The Q. & C. Company,**

700-709  
WESTERN UNION BLDG. CHICAGO, ILL.

The Tonawanda Electric Railroad Company has made another application to the common council of Niagara Falls for a franchise to run through various streets in that city. The matter will be considered on July 25.

One of the conductors of the Atwood street line of the Consolidated Traction Company, of Pittsburg, while leaning out of the side of his car was struck on the head by a car passing in the opposite direction and fatally injured.

The Tarrytown, White Plains & Mamaroneck electric railway, connecting these towns on Long Island Sound and the Hudson river is completed and in operation. The franchise permits the company to carry both freight and passengers.

The new line of the Quincy & Boston Street Railway to Weymouth Landing was formally opened to the public, June 11, and the occasion was duly celebrated by the railway and municipal officials and the residents along the line.

President Henry Fisher, of the Southern California Power Company, has purchased a controlling interest in the Redlands Street Railway Company and it is expected that the road will be extended and equipped with the electric system.

The interurban road between Newport, R. I., and Fall River, Mass., is now in operation. It required two hours for the first car to run between the two cities on June 19, but the regular schedule time will be 30 minutes less than that.

The stockholders of the Northern Traction Company have elected J. W. Lovett, of Anderson, Ind., president and W. W. Huffman, manager. The electric line will be built from Michigan City, Ind., to Laport. The capital stock is \$150,000.

President John L. Heins, of the Coney Island & Brooklyn Railroad Company, has purchased for \$60,000 the property of the Vanderveer estate in Coney Island, and a handsome terminal for the company's cars will be erected immediately on this site.

A dangerous-looking article, believed to be a dynamite bomb, was left on a car seat of one of the Capital Traction Company's cars, in Washington, D. C., by a mysterious stranger. No damage resulted, and the thing was delivered to the police.

Postmaster Hutchins, of Cleveland, is in Washington, urging the postal authorities to establish street railway mail service in Cleveland. It is said that mail cars will soon be running on the street car lines of that city if the wish of the citizens be regarded.

The initial trip on the Fox River Valley Interurban line between Neenah and Appleton was made June 19 and the line is already doing a good business. The cars are large double truck, interior finish in oak, and were built by Barney & Smith, Dayton.

July 4 and 5 were very heavy days for the Exeter (N. H.) Street Railway, and Superintendent McReel has received hearty congratulations upon the way in which the traffic was handled. Nearly 18,000 fares were registered each

day, and in addition the baggage cars were placed at the disposal of the doctors and used to bring to Exeter those killed and wounded in the severe storm.

The Birmingham (Ala.) Railway & Electric Company issues an eight-page vest-pocket folder, giving the time tables of the various street railway lines of the company and lists of the public buildings, churches and places of interest that may be reached by each.

On application of Thomas Lowry, one of the stockholders of the Duluth (Minn.) Street Railway Company, President L. Mendenhall was appointed receiver. This action was taken as a step in the reorganization made necessary by excessive capitalization.

After a spectacular performance at Clear Lake, Ia., three trains of the Mason City & Clear Lake Traction Company were returning home heavily loaded. There was a rear end collision and about 20 passengers slightly injured. The cars were badly damaged.

The Middletown (Conn.) Street Railway Company opened its Lakeview Park, at Crystal Lake, July 4. There are 15 acres in the park; the company will build a theater and all arrangements have been completed for the entertainment of visiting crowds.

The Milwaukee, Racine & Kenosha Railway Company has added some improvements to Piper's grove which is naturally a beautiful tract of land just north of Berryville. It is expected that many picnics and excursions will go there this summer, especially from Racine.

One of the Brooklyn trolley cars met with an unique accident a few days ago. While passing beneath the elevated railway structure the trolley jumped the wire and caught in the trough and the entire top of the car was pulled off much to the surprise and alarm of the passengers.

The gross earnings of the Brooklyn Rapid Transit Company's system for June, 1898, show an increase of \$85,033 over June, 1897, and \$107,520 over June, 1895; the earnings from operation for the year ending June 30, show an increase of \$352,984 over 1897, and \$541,594 over 1896.

It is practically assured that during the coming fall, the trolley line on the West Chester (Pa.) turnpike will be extended from Newtown Square, its present terminus, to West Chester, a distance of 10 miles. This will give continuous trolley connection between Philadelphia and West Chester.

The Charleroi, Bellevernon & Fayette Electric Railway Company has leased from the New York & Cleveland Gas Coal Company a 60-acre tract of land a half mile from Speers, Pa., for a pleasure resort. The railway line was extended to the park to accommodate the 4th of July traffic.

A broken chain was the cause of a serious accident near St. Elizabeth's government asylum for the insane, Washington, D. C., on July 10. An electric car on the Congress Heights road collided with a horse car on the Anacostia line; one man was killed and between 25 and 30 persons injured.



## THE BOSTON CONVENTION.

The American Street Railway Association Will Meet September 6th to 9th—Seventeenth Annual Gathering—Association Returns to the City of Its Birth—Fine Programs Prepared of Papers, Discussions and Entertainments—The Exhibits Will Be More Numerous and Displayed Under Better Conditions Than Ever Before—A Large Attendance from All Parts of the Country Assured—Attracted by the Opportunity to Study the Model Street Railway System of Boston, and Incidentally Combine Recreation with Work—Great Preparations Made to Entertain the Ladies.

It is especially pleasing that the convention this year should meet in Boston, for here it was, seventeen years ago, that the American Street Railway Association was organized. Great and undreamed of changes have come to both the city and the street railways during these years, until, in the present advanced developments, neither could scarcely recognize the other. Then, animal was practically the only motive power; and even the most progressive ones groped blindly in the dark for some steam power to supplant the faithful horse. A multitude of strange devices have come and gone; even the cable, once the object of great expectations, has had its day and is already in its decadence. Instead of barns, and watering troughs, and feed cutters, we will see and study some of the finest electrical installations in the world.

The official home of the convention is always a center for gatherings outside of the regular meeting hours, and this will be found at the Brunswick Hotel. The officers of the Association, and a large number of delegates, will stop here and at the Hotel Vendome, adjoining, which is under the same management. Rates at the various hotels will be found in another column.

Program of papers to be read at the sessions of the A. S. R. A. is also published in full on another page, and the subjects for reports and discussions are practical and timely topics. The opening session will be on Tuesday morning, September 6, in Paul Revere Hall, in the Convention building.

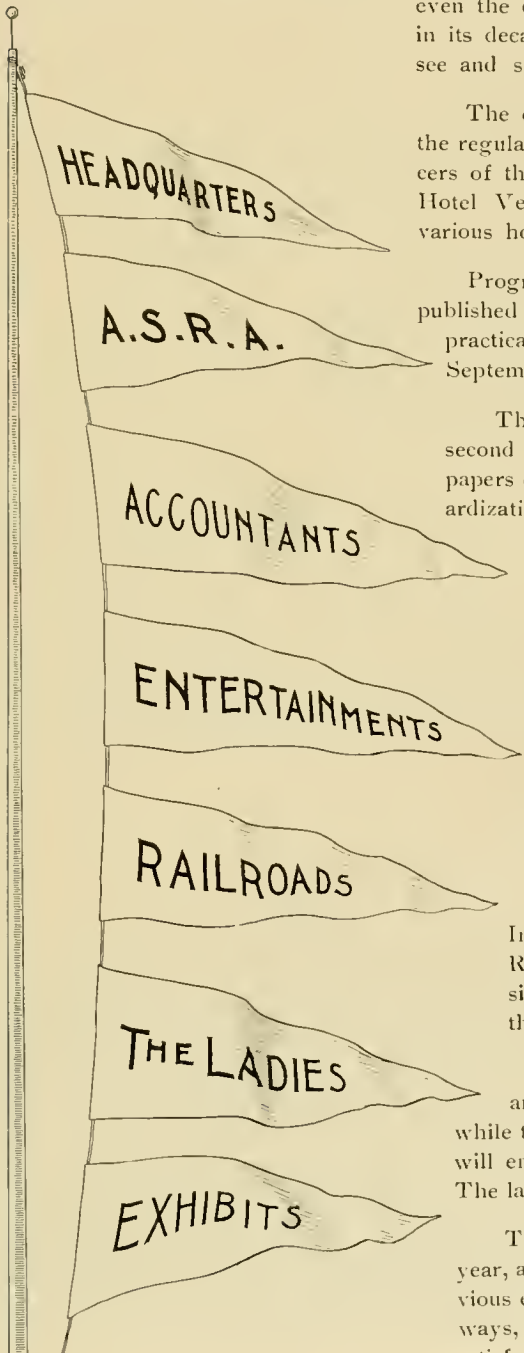
The meeting of the Street Railway Accountants' Association of America is its second annual gathering, and a large attendance is promised. The program includes papers on subjects of direct interest to accountants, and the important work of standardization of accounts so ably begun will be still further continued and perfected at this meeting. The members will also share in the entertainments and excursions provided for the American Association.

The local committees, realizing what a lively interest will be taken by visitors in the sights peculiar to Boston, and especially those points of historical renown, have provided a series of trips and entertainments that will occupy every spare minute outside of the routine duties and work of the convention, and which will give the guests a very satisfactory idea of Boston. Among the good things provided is a trip to Lexington, and on another day, an old fashioned clam bake, something the Association has never had; the nearest approach being the southern barbecue in Atlanta.

The railroads have made the usual concessions of a fare and a third for the round trip, subject to the established rules of the traffic associations. In purchasing tickets be sure to ask for the rate made the American Street Railway Association, not forgetting to have your tickets properly countersigned at Convention Hall before returning. The hour and place for doing this will be duly announced by Secretary Penington, and bulletined at the Hall.

The largest possible attendance of ladies is urged, and for their comfort and entertainment the local committees have made great preparations, so that while the gentlemen are engaged in the work of the convention the visiting ladies will enjoy numerous trips and rides. A shopping tour is also one of the features. The ladies will, of course, participate in all the excursions taken by the delegates.

The facilities for displaying the various appliances were never as good as this year, and the supplymen have accepted the opportunity in an effort to outdo all previous exhibitions. The space available permits of commodious aisles and passageways, and there will be no difficulty in getting near enough to exhibits to inspect them satisfactorily.



# BOSTON

## 1623 A BRIEF HISTORICAL SKETCH 1898

The old town of Boston was built on a peninsula some 780 acres in area, lying between the Charles river and that arm of Massachusetts Bay known now as Boston harbor. The Indian name of this peninsula was "Shawmut," meaning living fountains. The early Norse navigators are credited with having explored the Bay, and also the Dutch; Capt. John Smith visited Boston harbor and made a very creditable map of it; in 1621 Miles Standish and a party from the Pilgrim settlement at Plymouth explored the harbor, and while they were favorably impressed with the locality they made no effort to secure it. The first English settler was the Rev. William Blackstone, an Anglican clergyman who came in 1623 and laid out a farm and orchard on the site of the future city. Three other men settled on land now actually part of the city; these were David Thomson, "Gent.," who located on an island in the harbor; Samuel Maverick, a young man of property and education, who built him a house and fort on Noodle's or Maverick Island, now East Boston; and Thomas Walford, a blacksmith, who lived on the peninsula where Charlestown grew up.

In June, 1630, a fleet of ships landed at Salem (armed with a royal charter for the Colony of Massachusetts Bay) and the 700 colonists under the leadership of John Winthrop proceeded to settle on the site of Charlestown, Salem not proving to their liking; the water on the Charlestown peninsula not being good, the colony soon removed to Shawmut, known to the adjoining English settlers as Trimountain.

This name is the origin of the modern Tremont. It came from the three hills, Beacon, Copp's and Fort, which commanded the waters of the harbor and the surrounding hills also.

On September 17, 1630, at a meeting of the Court of Assistants it was officially ordained that the name of the settlement should be Boston, after Boston in England, which was the native place of some of the most prominent of the colonists. From this date the municipal life of Boston begins.

Your Puritan is an excellent thing in the way of ancestors, but it would seem that he made a bad neighbor; at any rate Blackstone, who at first welcomed the new settlers, disliked their stern manners and severe discipline and soon removed to Rhode Island. His rights as first occupant were recognized by the newcomers, and in 1634 Edmund Quincy, Samuel Wildbore, and others, were

authorized to levy a tax of £30, which was paid to Mr. Blackstone for his interests.

John Winthrop was the first governor of the colony and served as such for 12 of the 19 years that elapsed between the settlement of Boston and his death. Of him Josiah Quincy said: "Had Boston, like Rome, a consecrated calendar, there is no name better entitled than that of Winthrop to be registered as its patron saint."

Boston grew rapidly and trade relations were opened with the other colonies and with foreign ports, but the cause of education was not neglected and in 1642 the first commencement was held at Harvard College when "nine young men of good hope performed their acts so as to give good proof of their proficiency in the tongues and arts."

The political history of Boston, from the middle of the 17th to the middle of the 18th century, is largely that of Massachusetts; it tells of the unsuccessful effort to found a commonwealth wherein an established church would be the strong ally of the state; and of the struggle waged with the royal governors for the vindication of the principles of local self-government, and no taxation without representation.

The part that Boston took in the Revolutionary War is too well known to require comment; the stories of the Boston Massacre, and of the Boston Tea-Party are as familiar to Americans as the Declaration of Independence. The investment of the city by Washington, resulting in its evacuation by Gage and the departure of Howe, March 17, 1776, ended the fighting so far as Boston itself was concerned, but it was a dismal looking place, having borne the brunt of the first fierce struggle.

At the close of King Philip's war Boston had 6,000 inhabitants. By 1760 the city had grown to 25,000 and was probably the largest and certainly the most important town on the continent. This importance was due to its foreign commerce, its trade and industry, its accumulated capital, and the fact that it was the central point of the most compact population to be found on the eastern seaboard. The return of peace in 1783 found the city shorn of many of the attributes which had made her the foremost town of America. The population of 25,000 had sunk at the time of the siege to 10,000, and when peace came had risen to only 12,000. Military occupation, sickness, and the withdrawal of the



FANEUIL HALL (QUINCY) MARKET.







Visitors to Boston for the first time find themselves with hundreds of other tourists anxious to visit the interesting historical places which surround the "Hub," for every year there are thousands of persons who come here to study the romantic history of the Puritans from the day of their landing at Plymouth up to the more modern times. Then there are treasured landmarks of the Revolution.

Here were born many of our noted men, such as Samuel Adams, John Hancock, Chief Justice Sewall, Cotton Mather; Boston has been the home of the artists Copley, Stuart, Allston, Hunt; and of poets here were born and lived within an hour's ride, Longfellow, Lowell and Whittier. Here, too, was the birthplace of Julian Hawthorne and of Edward Everett; the home of Prescott, the historian; of Oliver Wendell Holmes, Phillips Brooks, Gilbert Haven, George Ticknor and many others. A walk about the city from any point will soon bring one to some place of which history speaks. A ride into the country, either to the north, south or west will take the pilgrim in a very few minutes to other fields, the scenes of heroic deeds of our forefathers.

Among more modern buildings that interest the visitor there are Boston's Public Library, the most complete of its kind in this country, the State Capitol and the new Court House. Then there are the active navy yard at Charlestown and Harvard University in Cambridge.

One of Boston's present historians says that one should at least spend three days in Boston proper to gain the personal knowledge of the historical riches to be found there. Even then one will be able to spend only a very few minutes at any one place.

First of all there is Faneuil Hall, the "Cradle of Liberty," of which everyone who ever glanced inside of a school history has learned something. It can be reached easily from all parts of the city as all lines of cars make a common center within five minutes walk of it. It is situated in the market place just off the lower part of Washington street, and it is from here that the tourist is advised to start.

Faneuil Hall was built in 1742, by Peter Faneuil, the rich Huguenot merchant, and presented to Boston for a market and town-hall. Smibert, the pioneer portrait-painter, served as architect. After burning, in 1761, it was rebuilt, partly by lottery funds, and dedicated by James Otis, the patriot orator. Here is Healy's great painting of Webster in the Senate, answering Hayne; and fine oil-portraits of Faneuil, Samuel Adams, Andrews, John Quincy Adams, Wilson, Washington, Everett, Hancock, Phillips, Burlingame, Preble, Strong, Choate, Sumner, Paine, Knox, Warren, Lincoln, and Rear Admiral Winslow; and busts of John and Samuel Adams and Daniel Webster. The handsome clock was presented by the school children, in 1850.

Faneuil Hall early won the title of "The Cradle of Liberty," for here the patriot orators of the province denounced the Brit-

ish tyranny before great assemblages of citizens. In retaliation the Fourteenth British Regiment was quartered here, in 1768; and in 1775-76 the Royalist garrison established a theatre here. Here occurred the state dinners to Washington, the Count d'Estaing, Lafayette, Jerome Bonaparte, Kossuth, the Prince de Joinville, Lord Elgin, Lord Ashburton, Talleyrand, King Louis Philippe, and other magnates; the receptions to Andrew Jackson and George B. McClellan; the lying-in-state of Anson Burlingame, and many public meetings, addressed by Wendell Phillips, Sumner, Everett, Channing, Otis, Webster, Hillard, Garrison, Beecher, Jefferson Davis, Evarts, Long, Reed, and other illustrious tribunes of the people. Every patriot, and every student of history will find a profound interest in this venerable Temple of Freedom.

The old state house in the middle of State street, at Washington street, with its pitched roof and quaint belfry, nestles quaintly low and dark amid the gigantic ten-story buildings which surround it, making a most effective contrast. Here was the site of the colonial market-stand; and from 1637 to 1711 it was occupied by a wooden Town House and Provincial Capitol, erected from the bequest of the eccentric Captain Keayne, with an open-sided market on the ground floor and the court and council rooms above, supported on Doric columns. The Town House burned in 1711, and was replaced in 1713 by the present building, whose inner parts, however, were ravaged by fire in 1747. On this spot presided Endicott, Leverett, Bradstreet, Sir Edmund Andros, Sir William Phips, Lord Bellamont, Dudley, Burnet, Shirley, Pownall, Bernard, and other royal governors; and here the loyal Provincial Legislature obeyed the Crown. The accession of the British sovereigns and the Provincial governors were proclaimed from the east balcony, "with Beat of Drum and Blast of Trumpet;" and the cupola was illuminated on rejoicing days. The lion and unicorn of England still adorn the gable overhead; but the sun-dial has been replaced by a clock. For half a century the Honorable Provincial Council, and its successor, the State Senate, met in the eastern hall, amid the royal portraits and insignia, and the House of Representatives occupied the western hall. Here, John Adams said, "the child Independence was born," when for 14 years the fiery eloquence of Otis and Quincy, Warren and Cushing, Hancock and Samuel Adams, was directed against British rule. The stamp act was publicly burned here; in 1768 a British regiment was quartered in the building, with cannon pointed at the doors. In 1770 the Boston massacre took place beneath the windows; and the British soldiers engaged therein were tried in the building. Here Generals Gage, Howe and Clinton held their councils of war.

From these portals Washington reviewed the triumphal entry of the Continental army; on July 18, 1776, the Declaration of Independence was read from the east window; and the proclama-



tion of peace in 1783. Here the State Constitution was planned; Hancock, the first governor elected by the people, inaugurated; and the Count d'Estaing and the officers of the French allied fleet received.

The legislature met here until 1798, when it marched in procession to the new State House on Beacon Hill. In 1835 William Lloyd Garrison was hidden here from the mob which had broken up an anti-slavery meeting, and was seeking to slay him. Here was opened the first public town library in American, in 1657. The first Episcopal services in Boston were held on this site, for half a year, in 1686; and the old South Church worshipped here for an equal period. From 1820 to 1830 the Grand Lodge of Masons of Massachusetts occupied most of the building, and here

removal of the British regiments, after the massacre, Warren here spoke to a packed house, including crowds of royal officers in uniform; and when one of these held up a handful of bullets, as an answer to the orator, Warren replied only by dropping his handkerchief upon the leaden threats.

In 1775 the pews were removed, and the church became a riding hall for the Queen's Light Dragoons, with gravelled floor, leaping bars, a sutler's shop in the gallery, and reserved galleries for admiring spectators. "Strange that the British, who so venerate their own churches, should thus have desecrated ours," said Washington, standing in the east gallery, after the redecoats had

After two centuries of occupancy of this site, it grew too noisy and too remote for religious services, and the Old South Society moved to Copley square, and the building became the city post-office, from 1872 to 1875. In order to prevent the destruction of the church for business purposes, a committee of 25 women paid \$430,000 for it, to be preserved as an historic monument; of this sum, Mrs. Hemenway gave \$100,000. The Old South Work centers here, and is a very successful plan to encourage the study of American history, by lectures, leaflets, discussions and prizes.



they entertained Lafayette. From 1830 to 1839 the city government occupied the building. In 1881 it was reclaimed from commercial uses, and carefully reconstructed as "hallowed by the memories of the Revolution." It was then placed in the care of the Bostonian Society, a thousand men of local pride, to be kept open for public homage, and to receive a museum of Provincial antiquities. The museum includes thousands of articles, and is the most important and interesting of its kind in America.

The Old South Meeting House, at Washington and Milk streets, belonged to the Third Congregational Society, which in 1670 erected here, on the site of Governor Winthrop's garden, a cedar church. Here Sir Edmund Andros installed the unwelcome Church of England; here Chief Justice Sewall on Fast Day begged God and man to pardon him for his evil share in the witchcraft trials; and here Benjamin Franklin was baptized, on the day of his birth across the street.

In 1730 the present brick edifice was built, wherein occurred the dramatic event commemorated in Longfellow's Ballad of the French Fleet. In perilous times, sentries on the tower watched the harbor and sea for the sailing in of hostile fleets. Whitefield's consecrated eloquence full often resounded in this great hall, and for 150 years the Election Sermons were preached here.

In time the meeting house became "the Nursery and Sanctuary of Freedom," when the revolutionary town meetings overflowed Faneuil Hall, and adjourned to this much larger auditorium, and were addressed by Otis, Warren, Hancock, and other patriot orators. Thus many thousands assembled here to order the royal frigate Romney from the harbor, in 1768. Demanding the re-

The church is open daily (25 cents fee) and its interior architecture, the galleries where Washington walked, the window where Warren entered, the sounding-board, and the other fine bits of Provincial work, are of great interest. Here also are collections of curiosities and antiquities, the old Spanish cannon in the entrance, the colonial fire-place and equipments, personal relics and autographs, portraits and engravings, old papers and books, chairs, cradles, clocks, spinnets, spinning wheels, umbrellas, fire-backs, foot-stoves, wool-combs, lanterns, warming pans, kettles, embroidery, samplers, spoons, china, muskets, swords, tomahawks, canteens, powder-horns, pistols, calashes, chapeaus, and shoes.

The church is partly clad with English ivy, and the tower-clock attracts more glances than any other in New England, rising as it does from the very heart of the Puritan City.

King's Chapel is another antique edifice that is worth visiting. The heavy portico was built in 1789 from funds partly raised by an oratorio in the Chapel at which George Washington attended. The interior is singularly old-English, even to the reading desk below the quaint, lofty pulpit (older than the church). The organ was brought from England in 1756 and bears a golden crown





and mitres. Here the pews occupied by Charles Sumner, Oliver Wendell Holmes and others are still pointed out to visitors. The high square pews are upholstered in red and half of them are facing away from the minister. The singular embrasured windows on School street gave point to Mather Byles' quip, "I've heard of the canons of the church, but I never saw its portholes before."

Richard Grant White says: "It is the perfect model of a New England meeting house of the highest style. It delights the eye by its firm, symmetrical proportions; and its octagonal spire, springing from an airy eight-arched loggia, is one of the finest of its kind, not only in this country, but in the world. Nothing more light, elegant, or graceful could be found."

The Liberty Tree stood near the southeast corner of Essex and Washington streets, where a large carving representing it may be seen high up on the front of 630 Washington street. The ground about and under the great elm, Liberty Tree, was called Liberty Hall, and here the 300 Sons of Liberty held their public meetings and festivities and organized revolution, during the last years of British rule. Their signal flag floating from the staff extending through the branches summoned the patriot bands; and many a fiery speech was heard here, many an effigy of a hated Royalist

hung from the branches; the British garrison had the tree cut down in 1775. The Liberty Tavern long occupied the site. Here now stands the office of "The Pilot."

The site of the Boston massacre is marked by a wheel-shaped arrangement of the paving-stones in State street, where Exchange street crosses. Here, the British main guard, provoked by missiles and epithets, fired upon the people, and killed and wounded nine persons. A bronze tablet on the Merchants' National Bank says: "Opposite this spot was shed the first blood of the American Revolution, March 5, 1770." Boston Common has a monument to this event.

West street leads westward, by various music, candy, flower and other shops, and the Universalist Publishing house, at No. 30, to Boston Common, at the ancient site of the whipping-post and pillory. At 13 West street, Hawthorne for years courted Sophia Peabody, to whom he was married here in 1842, by James Freeman Clarke, who in 1864 officiated at his funeral; Shreve's great jewelry store occupies the entire building at West and Tremont streets.

The Boston Tea Party is commemorated by a large bronze tablet about six feet above the sidewalk, on the Atlantic avenue front of Luce & Manning's wool warehouse, at the corner of Pearl street. It bears an animated relief of the attack on the tea-ship, and borders of tea-leaves, with the inscription: "Here formerly stood Griffin's Wharf, at which lay moored on Dec. 16, 1773, three British ships with cargoes of tea. To defeat King George's trivial but tyrannical tax of three pence a pound, about ninety citizens of Boston, partly disguised as Indians, boarded the ships, threw the cargoes, 342 chests in all, into the sea, and made the world ring with the patriotic exploit of the Boston Tea Party."

"No, ne'er was mingled such a draught  
In palace, hall or arbor,  
As patriots brewed and tyrants quaffed  
That night in Boston harbor."

The Province House long since yielded to the ravages of time, and but little remains to it except the massive north wall, three stories high, with deep arches. Its masonry is partly covered by a sheathing of wood. This fragment may be reached by descending to the end of the first rubbish-laden alley, four or five feet wide, diverging from Province street, south of School street, or it may be seen, close at hand, and with more ease and decency, from the rear window of the store at No. 321 Washington street.

The Province House was built in 1679, and served as the official residence of the Provincial Governors from 1716 to about 1790. It was a gambrel-roofed brick house, with a cupola crowned by a copper statue of an Indian with glass eyes, a balcony whence the governor's speeches and proclamations were delivered, and a fine reception hall. In front extended a broad lawn, with oak trees. The house was built by Peter Sergeant, a rich London merchant, and bought by the Province in 1716. In 1811 the building was granted to the Massachusetts General Hospital, which leased it in 1816 to David Greenough for 99 years. For many years it was a playhouse for negro minstrels, until its woodwork was burned



"WASHINGTON ELM"—CAMBRIDGE.



out in 1864. Hawthorne's Legends of the Province House is interesting reading. Near this locality is the lofty Boston Tavern, for men.

Down on Salem street stands Christ church, of which much has been written, as it was prominent in the early history of the state. From the window of the fine spire the old sexton displayed the famous signal lanterns, April 18, 1775, which told that a raiding expedition was leaving Boston headed by the British general, and Paul Revere, waiting on the Charlestown shore, spurred his horse onward, alarming the sleeping countryside. In the vaults of the church rests Major Pitcairn with other British officers killed at Bunker Hill.

Longfellow's house, on terraces in broad and pleasant grounds, was built in 1759, by the Tory Colonel Vassall, of brick covered with wood. It was occupied by Washington during the eight months of the siege of Boston, and by Longfellow from 1837 to 1882. His family dwells there now. The general's office and the poet's study were in the first-floor room, toward the college. "Hyperion" and "Voices of the Night," were written in the chamber overhead, the sleeping-room of Washington and Longfellow. Across the street is the Longfellow Memorial Park, to keep open the view to Charles River. Lowell's house, Elmwood, farther out on Brattle street (the ancient "Tory Row"), was built in 1760, and occupied by Lowell for many years. He died here in 1891. Some of his best poems and essays came from the third-floor room.

Just back of Phillips', on Exeter Place, dwelt Theodore Parker, the famous Unitarian divine and reformer. Gilbert Stuart's house and studio were at the south-east corner of Essex and Edinboro streets (at No. 59 Essex street).

Wendell Phillips' home stood at the corner of Harrison avenue and Essex street, where a tablet on a tall yellow building bears this inscription: "Here Wendell Phillips resided during 40 years devoted by him to efforts to secure abolition of African slavery in this country. The charms of home, the enjoyment of wealth and learning, even the kindly recognition of his fellow citizens, were by him accounted as naught, compared with duty. He lived to see justice triumphant, freedom universal, and to receive the tardy praises of his former opponents. The blessings of the poor and friendless, and the oppressed, enriched him. In Boston he was born, Nov. 29, 1811, and died Feb. 2, 1884. This tablet was erected in 1894, by the order of the City Council of Boston."

Samuel Adams' home was a two-story wooden house with a garden, at Winter street and Winter place. Its site is marked by a tablet on Shepard, Norwell & Co's, dry goods store, thus inscribed: "On this site once stood the home of Samuel Adams, who bought it in October 2, 1803. In grateful memory of the Father of the Revolution, this tablet is placed by the Massachusetts Society of Sons of the Revolution, 1893."

Franklin's birthplace, at No. 17 Milk street, is marked by a bust of the great philosopher. No. 19 Milk street is the home of the Massachusetts Commandery Military Order of the Loyal Le-



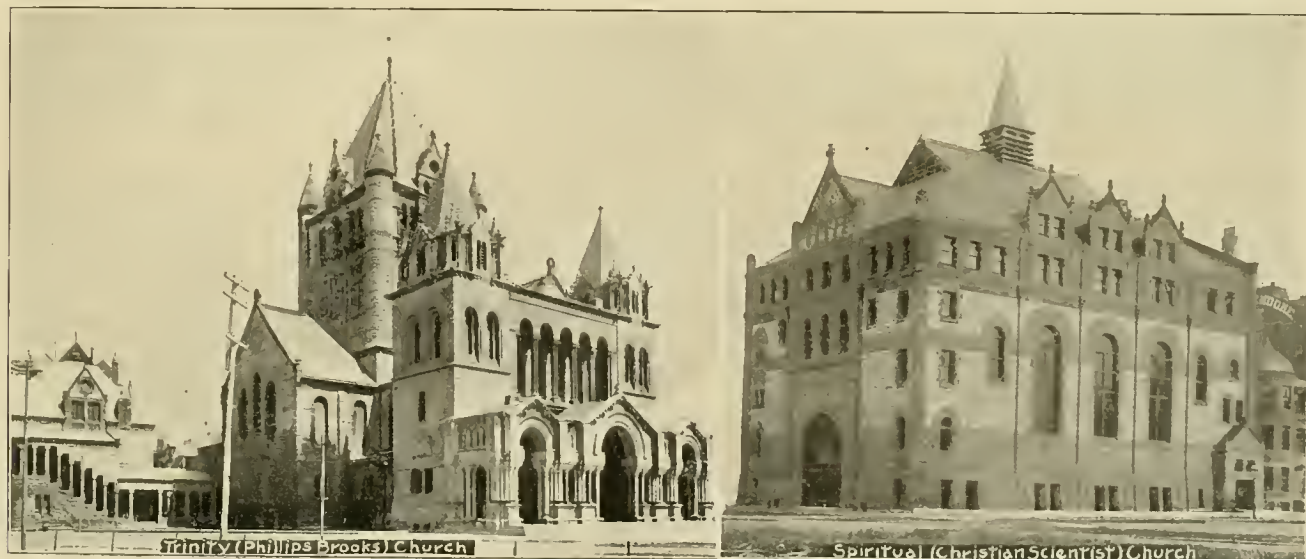
THE OLD BELFRY—LEXINGTON.

gion, and of the Society for the Prevention of Cruelty to Animals.

John Winthrop's home was near the present 286 Washington street, where a bronze tablet marks the site, where also dwelt John Norton and Samuel Willard. Winthrop's house was torn down for fuel, by the British garrison, in 1775.

The Old Corner Book Store, at Washington and School streets, on the site of the house of the strong-minded heretic, Anne Hutchinson (a relative of Dryden, the poet), was built in 1712, and contained an apothecary's shop from 1712 to 1796, Thayer's dry goods store from 1796 to 1816, and then a pharmacy run by James Freeman Clarke's father. Since 1828 it has been a book store, where Ticknor & Fields held sway from 1833 to 1865, when the place was the favorite resort of Hawthorne, Hillard, Emerson, Agassiz, Sumner, Lowell, Longfellow, Whittier, Holmes, Whipple, Thoreau, Howells, and other literary men. Here Dickens and Thackeray used to browse among books, when in Boston. Oliver Ditson began his career at a little music counter here in 1833. The shop is still frequented by the local writers and readers.

The birthplace of the Republican party in Massachusetts was



Trinity (Phillips Brooks) Church

Spiritual (Christian Scientists) Church





CANOPY OVER PLYMOUTH ROCK—PLYMOUTH, MASS.

in the room over No. 40 School street, where Sumner, Wilson, Bird, and other radicals assembled the leaders of the anti-slavery wing of the broken Whig party. Farther up School street appear the City Hall, King's Chapel, and the Parker House. As Washington street approaches the Old State House, in the region of railway and steamship ticket offices, obscure alleys diverge, very familiar to the Bostonians, but mysterious enough to strangers within the gates. On the left they lead to Court square, between the City Hall and the old Court House. Young's is nearly hidden behind the Roger's building, which stands on the site of the First Meeting House from 1640 to 1808.

The Bell-in-Hand is a curious old tavern-sign projecting into the crowded and noisy Williams Court (which Rufus Choate pronounced "ignominious but convenient"), back of the Herald building. It marked the ale-house of the town-crier, on Congress square, until 1854, when it was brought hither, with other pictures and paraphernalia. Here the visitor may see the sanded floors, pewter tankards, and quaint old pictures of the Provincial era.

King's Chapel Burial Ground lies between the Chapel, the City Hall, and the Historical Society; bronze tablets on the gates bear interesting inscriptions. The keys may be obtained at the Board of Health office, in the Old Court House. The cemetery dates from 1630, when Captain Welden was "buried here as a souldier, with three volleys of shott." In the north part is the tomb of

John Winthrop, the founder of Massachusetts, and his son and grandson, both governors of Connecticut; also, of the Olivers; Lady Andros; Governor Leverett, who died in 1679; Thomas Brattle, the richest merchant in New England; Jacob Sheaf, and his widow's second husband, Rev. T. Thatcher, and the four pastors of the First Church, Cotton, Davenport, Oxenbridge, and Bridge. In the northeast, near the old charnel-house vault, is the tomb marked: "Hear . sleeps . that . blessed . one . whose . life . God . help . us . all . to . live . that . so . when . Time . shall . be . that . we . this . world . must . leave . we . ever . may . be . happy . with . blessed . William . Paddy." The cemetery has the graves of Judger Adams and Wait Still Winthrop, Oliver Wendell and Thomas Dawes. Capt. Roger Clap, died in 1690, longtime governor of the Castle; Maj. Thomas Savage, in 1682, "the fiter of Indians;" John Winslow and his wife, the Mary Chilton who was the first woman of the Mayflower company to set foot in Massachusetts; and Charles Bulfinch, the architect. There are 18 coats-of-arms carved on these gravestones, and many strange inscriptions appear on the hundred tombs. The closing scenes of "The Scarlet Letter" occurred here, where Hester and Dimmesdale were buried.

The Granary Burial Ground was opened 1660, on a part of Boston Common; planted with trees in 1830; enwalled with iron and ivy-clad portal in 1840; and provided with bronze memorial tablets on the gates in 1882. More illustrious dead are there than in any other Boston cemetery; among them John Hancock, Samuel Adams, and Robert Treat Paine, signers of the Declaration of Independence; eight governors, including Bellingham, Dunmer, Sumner, Sullivan, and Gore; Lieutenant Governor Cushing, Chief-Justice Sewall, Mint Master Hull, Paul Revere, Peter Faneuil; Jeremy Belknap and other divines; Mayor John Phillips, and Uriah Cotting. Franklin erected here a monument to his parents, which was replaced in 1827 by the high gray pyramid in the center. John Hancock's grave is marked by a tall marble monument, set up by the Commonwealth in 1895, and bearing his medallion portrait; it is near the church. His was the first and bold name signed on the Declaration of Independence. Toward the Tremont building were buried the victims of the Boston massacre and also many Huguenots.

Copp's Hill Burial Ground, on Hull street, is opened from 8 to 12 and 1 to 6:30 daily, and visitors can buy a descriptive pamphlet and be guided by the vendor. It overlooks the Charles river and contains many trees, and the tombs of the Sigourneys, Greenwoods, Snellings, Lorings, Hutchinsons, Grays, Eliots, Mountforts and other great families, besides many a grave whose fluttering flag tells of a hero of the War of the Rebellion. Every one goes to see the grave and monument of Cotton Mather, the illustrious Puritan divine, and the author of "Magnalia Christi Americana." It is a slab of brownstone on a vault of brick, in the southeast corner.

The Central Burying Ground, near Boylston street, on the Common, dates from 1756. Gilbert Stuart, the portrait painter of King George III., King Louis XVI., and President Washington, is the most illustrious of those buried here; his tomb is No. 61. Many British soldiers were buried in trenches in and around this



Custom House



Court House



cemetery, whose venerable and forgotten tombs are overarched by trees.

Mount Auburn, the first garden-cemetery in the world, dates from 1831, and covers 136 acres of beautiful hills, dales, flower beds and ponds. In this cemetery are buried 32,000 persons, among them Agassiz, Spurzheim, Bowditch, Asa Gray, Ticknor, Sparks, Felton, Fields, Palfrey, Willis, Pierpont, Quincy, R. C. Winthrop, Burlingame, Channing, Rufus Choate, T. W. Parsons, Dorothea Dix, Fanny Fern, Dr. Howe, and the Universalist apostles, John Murray and Hosea Ballou; Phillips Brooks is near the

Kearsarge which sunk the Alabama; Governors Rice and Gaston, Col. Joseph Williams, Martin Millmore, the sculptor; Linus Childs, the eminent lawyer, and Rev. A. A. Miner.

Bunker Hill monument, in Charlestown, built in 1825-42, of Quincy granite, is 30 ft. square at the base, and 221 ft. high. The top is reached by 294 steps, and superbly overlooks the city and the sea, and the far mountains, Wachusett and Monadnock. Here are two quaint Provincial cannons. Dexter's statue of Warren is in the lodge and Story's noble bronze statue of Colonel Prescott stands in the main path. On a June night of 1775 Prescott led his



old chapel; Lowell to the left of the gateway; Longfellow and Parkman, on Indian Ridge; Holmes, on Lime avenue; and Sumner, Everett, Edwin Booth and Charlotte Cushman, near the far-viewing tower on the hill.

Forest Hills Cemetery contains over 204 acres and asleep there are many noted men. A fine bronze tablet marks the grave, on Eliot path, of Gen. William Heath who issued the first general order of the Revolution, and also the last general order at the disbandment of the Revolutionary army. On the summit of Mt. Warren in a lot in the shape of a half moon, the ashes of the famous General Warren with other members of his family have been re-interred. Among the others buried there are Major General Dearborn, Admiral John A. Winslow who commanded the

1,500 New England volunteers here and fortified; and at morning was attacked by 4,000 royal troops, whom he and Putnam repulsed twice; and then they stormed his redoubt. The British lost 1,154; the Americans 441. Charlestown was burned during the fight. Massachusetts sent more troops into the armies of the Revolution than did all the southern colonies united.

In Charlestown, which is a part of Boston, is the Charlestown Navy Yard which ranks well up with the navy yards of the country. There are always between 300 and 3,000 men at work making repairs to some of our warships. In the very near future this is to be the largest torpedo-boat station in the world. Then there is to be a tremendous stone dry dock of sufficient size to take in the largest warship. In the yard there are many relics of the



past war and the commandant at this station is, in times of peace, always pleased to have visitors call at the yard so long as they do not interfere with the workmen there.

The Boston Public Library, situated on the west side of Copley square, is the most costly and artistic library building in the world, and is by far the largest library in the world for free circulation. It was opened in 1852, largely by the efforts of Everett and Ticknor, and the building was finished in 1895, having cost over \$2,500,000. It was designed in the pure, stately and elegant style of the Italian Renaissance. It is of pinkish-grey Milford granite, and faces on three streets, with a conspicuous roof of brown Spanish tiles, and a cloistered courtyard inside containing a lawn and fountain. The building covers  $1\frac{1}{2}$  acres. The



WITCH HOUSE—CAMBRIDGE.

grand stairway with colossal marble lions commemorating the dead of the 2d and 22d Massachusetts Regiments in 1861-65, leads to Bates Hall, an immense reading room occupying all the Copley square front with a barrel vault ceiling and rich furnishings. The library has very rich special collections about costumes, Spanish literature, music, mathematics, patents, architecture, New England history, Shakespeare, etc., each in a special hall. It contains about 680,000 volumes.

Trinity Church, on Copley square, is the most artistic and impressive church in New England. Phillips Brooks was its rector from 1869 to 1891. The society dates from 1728; the present church from 1877. It was designed by H. H. Richardson, in the Romanesque architecture of Southern France and Spain. The chief external features are the outlying chapel; the quaint cloisters, containing the ancient stone tracery from a window of St. Botolph's Church, in English Boston; the rich Galilee porch, built in 1894-95, and the vast and impressive central tower, suggested by one at Salamanca, and rising to a height of 211 ft., with a width of 46 ft. The ivy-clad walls are of yellowish Dedham granite and brown sandstone, and the huge tower-roof is of red Akron tiles. The interior is marvelously rich, with a chancel 57x53 ft., and many English, Parisian and Tiffany stained-glass memorial windows, and the famous Biblical frescoes by John LaFarge, including Jesus and the Woman of Samaria. This majestic building cost over \$800,000, and is all paid for. The services are "low." E. W. Donald is rector. The north cloister doors are opened daily, from 8 to 4 (Saturdays, 8 to 12), to admit visitors.

The State House occupies the terraced crest of Beacon Hill, facing the Common. It was built in Samuel Adams' governorship, in 1795-98, on John Hancock's cow-pasture (bought for \$4,000), with Bulfinch as architect. Crowning the highest of Old Boston, it is a very noble landmark from distant points on sea and land. The high dome was covered in 1874 with pure gold-leaf (renewed since), and may thus be recognized, shining brightly, from leagues away in the coast and rural counties. The new State House Extension, much larger than the original building, and of finer materials, but similar architecture, stretches northward. It was built 1890-95, at a cost (with land) of \$5,000,000, with fine marble colonnades, and a central courtyard. The chief feature is the Representatives' Hall, in Italian Renaissance architecture, elliptical, with mahogany finish, Corinthian columns, a domed ceiling of glass, frescoes by Frank Hill Smith, and the

famous wooden codfish, 5 ft. long, hung up in 1784, in the place of one placed in the Representatives' Hall before 1730. The fish is emblematic of one of the chief sources of the wealth of Massachusetts. The State Library, of 90,000 volumes, has a spacious reading room, whose balcony overlooks the crowded northern suburbs.

This was the first State library in America. The book-shelves are of steel. Here may be seen nearly 300 flags of the Massachusetts troops in the Rebellion, very sacredly guarded; Sir Francis Chantrey's esteemed statue of Washington, set up in 1828; Ball's excellent portrait-statue of John A. Andrew, the War Governor, erected in 1871, at a cost of \$10,000; busts of Washington, Lincoln, Sumner, and Vice-President Wilson; the venerable portraits of dignitaries, and the handsome old-fashioned Senate Chamber; weapons and trophies from Lexington and Bennington, and other interesting pictures and antiquities. On the outside terrace stands Powers' statue of Webster given by popular subscription in 1860, and Emma Stebbins' statue of Horace Mann, the educator, given by the school-children in 1869.

The peculiar front of Tremont Temple, on Tremont near School street, attracts the eye of the passer-by, for a building of its height is seldom seen with a plain, windowless front wall, and the odd Venetian effect of this blank surface also lends much to its beauty. Built primarily for religious purposes it houses beneath its roof the main auditorium with a seating capacity of 2,500 and five other halls of various sizes, with a large number of committee rooms, parlors, etc.

Being a church of the people the income to carry on its grand work is raised by different methods; an important source of revenue is the rental of nearly 100 business offices and stores which are located within its walls. The present Temple is the fourth which has stood on this same spot, the three others having been destroyed by fire. Tremont Temple was dedicated in 1896 and cost \$500,000. It is absolutely fire-proof in construction. Its foundations are laid 30 ft. below the sidewalk and it is built on the modern steel frame plan. It has an electric plant of its own, is heated by steam throughout, and with its two elevators, telephone system, restaurant and other features is one of the most convenient office buildings in the city.

The Suffolk County Court House is in Pemberton square, formerly an aristocratic residence-quarter (opened in 1835), a few rods from Scholly square up Beacon Hill. It is an immense granite building, erected in 1887-94, in German Renaissance architecture, at a cost (including the land) of \$3,828,000. There are four open court-yards and a great number of spacious court rooms, with durable, simple, and dignified furnishings. A handsome ves-



ESSEX STREET AND INDIA HALL—SALEM.

tibule of yellow Tunis marble leads to the great hall, a really noble apartment, with Indiana limestone pillars and rich decorations. Here are 16 strong and impressive limestone statues, by Domingo Mora, of Spain, representing Legislation, Religion, Rea-





HARBOR AND TOWN OF MARBLEHEAD, MASS.

son, Wisdom, and other attributes. The great hall is paved with black and white marble, and wainscoted with polished Maine granite, a beautiful stone.

White Ionic columns support the third gallery, above which bends the arched ceiling of yellow and gold, with armorial frescoes. Elevators run to the upper floors, and the probate, superior, municipal, criminal, and supreme courts; and to the Social Law Library (founded in 1804), a fine hall 180 ft. long, with 30,000 books, and portraits of eminent jurists.

The City Hall, on the north side of School street, east of King's Chapel, is a substantial and fireproof Renaissance building, of white Concord granite, erected in 1862-65, at a cost of \$500,000, and filled with commodious rooms for the many and costly municipal departments. On the lawn in front stands Ball's bronze statue (erected in 1879) of Josiah Quincy, the great mayor (in 1823-28), also a congressman (1805-13) and President of Harvard (1829-45). The drapery is heavy, but the portrait is good. Here, also, stands R. S. Greenough's fine bronze statue of Franklin, erected in 1856, from a popular contribution of \$20,000, and dedicated by R. C. Winthrop. The verd antique marble base has four interesting bronze reliefs: on the south the boy Franklin, learning to print; east, signing the Declaration of Independence; north, drawing electricity from the clouds; and west, signing the Treaty of Paris, in 1782, ensuring American independence.

The postoffice, covering more than an acre, between Milk, Devonshire and Water streets, was erected in 1869-85, of Cape Ann granite, at a cost of \$6,000,000. The eastern front is crowned by two fine and highly commended groups of colossal statuary, in Vermont marble, by D. C. French. The right-hand group shows Science controlling Electricity and Steam (a crouching slave); and the left-hand group shows Labor protecting the Fine Arts (a vase bearer), and the Family (a woman and child). The time ball on the eastern dome drops every noon by telegraphic signal from the Harvard Observatory.

The Sub-Treasury, on the second floor, sometimes contains over \$10,000,000. The Pension, Internal Revenue, Treasury Agents, Naval Pay, and other offices are in this building.

Steiner Hall, at 162 Boylston street, is situated entirely below the surface of the ground; it is elliptical in shape with the stage at one end. The architectural treatment of the hall is carried out in the style of the Italian Renaissance. The decorations of the architectural surfaces, cornices, pilasters, mouldings, etc., are

very chaste and delicate in treatment. The pilasters are surmounted by handsome Corinthian capitals. The frieze of the cornice has a handsome festooned sign of conventional fruit alternating with flowers. The color scheme is very artistic and refined, in quiet taste, the predominating tone being a delicate ivory contrasted with a very delicate color on the walls of sufficient depth to relieve the ivory and give warmth to the whole. The ornamental portions are brought out by a moderate use of gold leaf. As there are no windows in the hall the light is entirely artificial, but so cunningly arranged that all parts of the hall are as bright as day, yet all suggestion of glare is removed. This effect is produced by concealing incandescent bulbs in recesses of the frieze and stage arch, whereby an equal radiance of soft, mellow light, devoid of any shadows, is diffused throughout the auditorium. The acoustic properties of the hall are as perfect as it is possible to have them, and the same may be said of the ventilation and heating. The seating capacity of the hall is 600. It is absolutely fire-proof, and, from its unique location, underground, completely sound-proof.

Quincy Market (the official title is "Faneuil Hall Market"), is a two-story granite building 535 ft. long, with a dome and Doric porticos, crowded and surrounded with stalls rich in all varieties of delicious food, meats and game, fruits and vegetables, and (at the east end) a great diversity of fish and other sea-food. Longfellow came here, and of it said: "The mingled and delicious odors of the vegetables, and the sight thereof, transported me straightway to France." There is a peculiar guild pride among the sturdy and stalwart marketmen, and when they march in political or other processions, in long, white frocks, squadron after squadron of horse, and company after company of foot, the sight is an impressive one.

The theater district extends a block northward on the narrow and picturesque Washington street, including three famous playhouses, with two more on its edge. This is one of the most crowded and busy thoroughfares in the world, with its narrow and huddled sidewalks, and a roadway traversed by thousands of vehicles. The sharp curves and bends reveal singular and piquant architectural effects, in the many varying colors and styles which characterize the adjacent buildings. The scene is especially brilliant just as the theaters are out, and the playgoers throng the way.

Chinatown in Boston is a cleanly and interesting district, in-



BUNKER HILL MONUMENT.





CHARLESTOWN NAVY YARD—FROM BUNKER HILL MONUMENT.

habited by an industrious and frugal people. In going up Beach or Essex street we pass along the edge of the Chinese quarter, where Oxford street and place are crowded with Mongolian homes, the central point of the 3,000 Asiatic Bostonians. They have on Harrison avenue a score or more of stores—for tea, Celestial groceries, china, dress fabrics, incense, teak articles, books, fire-crackers, and other Asiatic wares. Here are restaurants where chop-sooy, chow-mein, and Chinese teas and wines, and rice whisky are served over teakwood furniture; a joss-house and Christian mission, and a very large Masonic lodge; besides, hidden fan-tan and opium joints, often raided by the police.

Out in Cambridge is Harvard University, the illustrious crown of American education and which was founded in 1636 by the legislature. It has 4,000 students, with medical, dental and veterinary schools in Boston, and academic, law, divinity and scientific schools here. Its property equals \$12,000,000. The yard covers 22 acres and there are 22 buildings. The handsome \$10,000 gateway gives entrance between Harvard Hall, built in 1765, and the ivy-clad Massachusetts Hall, built in 1720, which was once a barracks for Revolutionary soldiers. Out on Cambridge Common, where the students gather for pleasure, stands a noble elm facing the entrance of the Shepard church. It was under this elm that Washington took command of the army. And here are many of the spoils of war.

The Clark family noted as the famous lens makers are dead, but their names and lenses will live forever. Over in Cambridgeport off Brookline street the Clark factory, a low building, is still in operation. Every astronomer in the world knows this family, and the world was greatly advanced in this art by this illustrious firm of Alvan Clark & Sons. Alvan Clark died in 1887 and one son, George, had died several years before. Alvan Clark, Jr., died June 9, 1897.

The senior member of this firm began lens making by accident. He was a portrait painter and a good mathematician. When 40 years of age an optician asked him to figure out the proper curves for a lens and he did so. Finding that opticians knew very little about lens he began experimenting. His first venture was a 5-in. refracting lens with which he could see the rings of Saturn. The first big glass turned out was an 18-in. object glass for the Michigan University in 1860, which finally went to Chicago. The second, in 1870, was a big lens for the Naval Observatory at

Washington; the third, a 30-in. glass for the Pulkova Observatory in Russia; the fourth a 36-in. glass for the Lick Observatory in California.

Mr. Yerkes wanted a 45-in. glass, but Mr. Clark satisfied him with one measuring 41½ in. Twelve years ago the block of glass was taken from the furnace of M. Mantois, Paris. It weighed 600 pounds and cost \$800. Mr. Clark began work on it in 1892. For two years it was ground by emery powder which was reduced in fineness as the operation proceeded. For another year it was polished with jeweller's rouge and beeswax until the lens was considered finished.

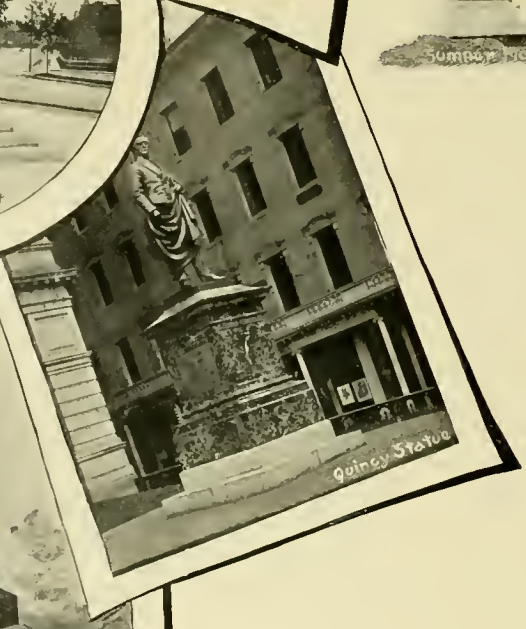
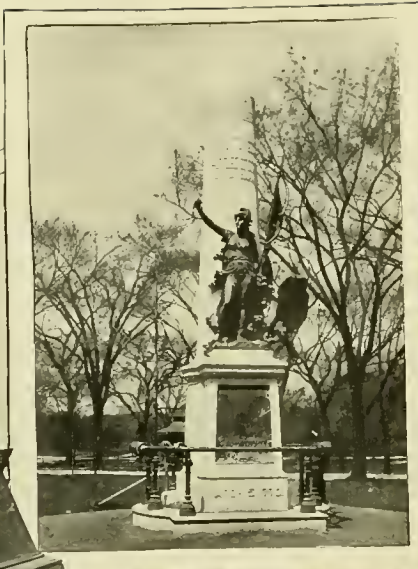
Mr. Clark, Jr., was himself a practical astronomer and made several discoveries.

In the near vicinity of Boston there are many historical places of which New Englanders are exceedingly proud to speak, and show to visitors. Lexington and Concord are easily reached by trains, and even street cars. In Lexington there is a boulder that marks the line of the minute-men; then there is the house in which were Hancock and Adams asleep when Paul Revere came dashing into the town and aroused them from their slumbers to take up arms.

There are tablets showing where the British rallied on the Concord road. The six mile road to Concord has many more tablets showing where the Americans harassed the British on their advance to Concord. In Concord there is the old North Bridge which was the scene of the Concord fight, when 400 Middlesex men drove away three companies of British light infantry. On one side are the graves of the British and the old monument, and on the other the picturesque bronze statue of the Minute-man. In the Sleepy Hollow Cemetery are the remains of Hawthorne and Emerson.

Out in Watertown is the U. S. Arsenal, where the government is making the largest kind of gun-carriages which are used in the defences of our coast at the present time.

A trip to Plymouth is considered a necessity, as here was laid the corner stone of the Republic. Plymouth rock is on the shore of the town and the upper part of the canopy which covers it contains some of the remains of the Pilgrims who died during the first winter. Burial Hill, the site of the fort built in 1621, contains the graves of the great Pilgrim leaders. On the way down on the steamer one passes Brant Rock, where Daniel Webster lived and is buried.



Patrol Boat

Army & Navy Mon't.

John Boyle O'Reilly Mon't

Franklin Statue

Kief Ferguson Statue

Quincy Statue



## THE STORY OF BOSTON.

BY LILLIAN WHITING.

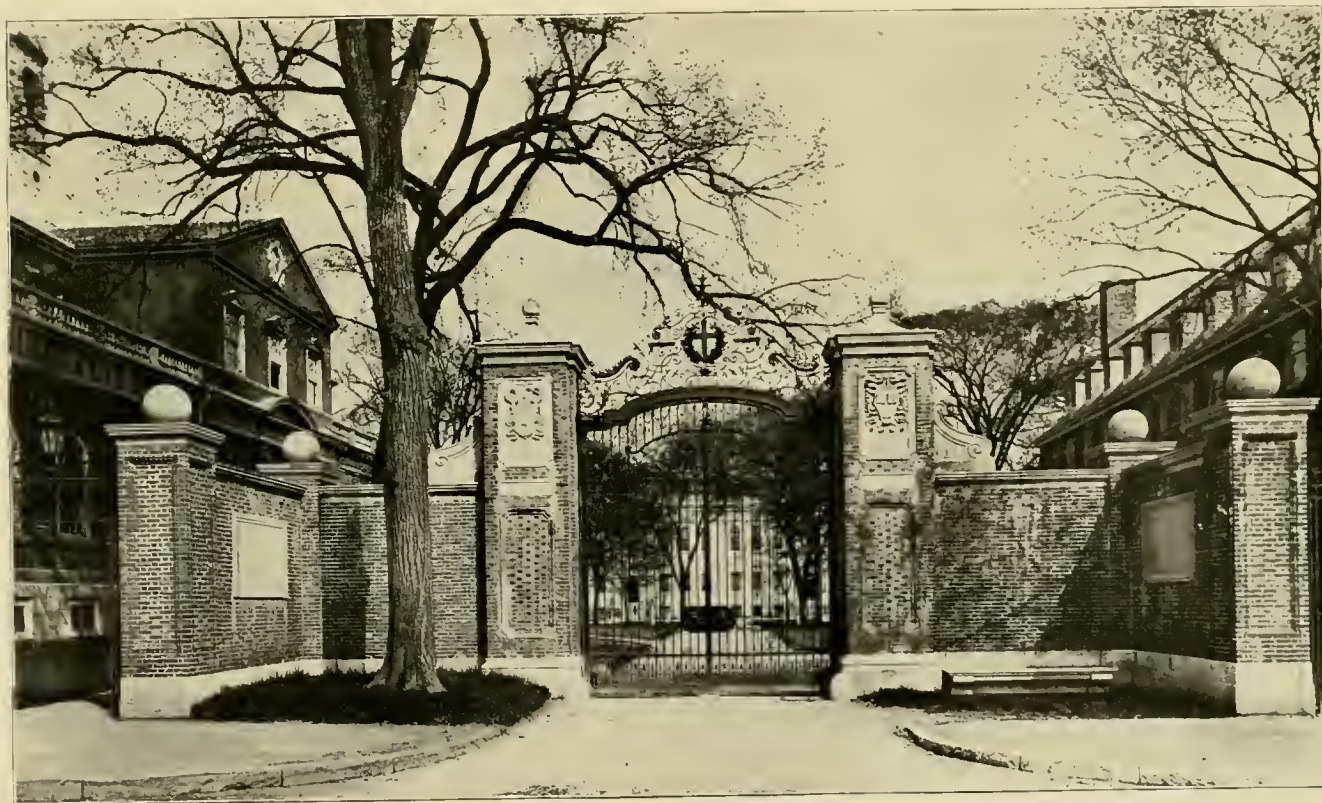
The story of Boston is a spiritual romance. It is a tale of aspiration regarding all that makes for the higher life—which is the essential life—and privation regarding all conditions of self-indulgence and ease. No one can read, unmoved, the records of the founding, of the development, and of the growth of Boston. It is the most marvelous commentary on all the significance of life; and tracing it backward no one need wonder that this city has always stood for intellectual vigor and moral greatness.

It might well seem, indeed, that the Lord had given his angels charge concerning this city of the Puritans. Yet the story also reveals to us how subject to error are the judgments of men, and

somewhat peculiar civilization that Boston has developed? For it cannot be denied that, as a city, it has a certain unique quality of individuality which inspires a special interest.

The story of Boston really begins in London, on July 28, 1629, when a group, including John Winthrop, Thomas Dudley and Richard Saltonstall pledged themselves "to cross the seas under God's protection," and "continue to inhabit there;"—a resolution ratified the next month before the court at Cambridge, and soon afterward fulfilled—John Winthrop being chosen as the leader and governor. So they set forth.

It was on September 17, 1630, that Governor Winthrop looked



GATEWAY ENTRANCE TO HARVARD UNIVERSITY—CAMBRIDGE.

that there are pages in her history—those on which are recorded the dragging of Garrison through the streets—that one would fain efface from her records. Morality is, however, a progressive science, and the descendants of the men who mobbed Garrison have placed a statue of the great agitator in the heart of the choicest residence district of Boston.

Looking backward to the summer of 1629 one sees that Boston has had her definite periods of history. She was planted in prayer and devotion; she was developed amid early hardships which invigorated her moral power; her general life, even when she was a primitive Puritan town, had always a certain stateliness as was befitting the people of "quality and eminent parts." The aristocracy of character has always prevailed.

The story of Boston is crescendo in interest and her development has proceeded at an always accelerating rate. The past decade has concentrated the progress of the preceding fifty years, and the half century before held in solution the progress of the entire century, and more, that had passed since her founding. Shall we glance briefly at the determining causes of the

across the Mystic river and declared "that Trimontaine should be called Boston" in memory of the English town where the Rev. John Cotton preached. To this date Boston traces its birthday. In the present Tremont street is retained the old name of Trimontaine, from the three hills more prominent in those days than now.

In the midst of all their hardships and privations, John Winthrop wrote to his wife: "We are in Paradise where we enjoy God and Jesus Christ. Is this not enough?"

In 1637 there arrived in Charlestown, the Rev. John Harvard, who died one year later, but whose brief residence produced far-reaching results, for it was he who founded Harvard College, making a gift of £800 (\$4,000), which laid the foundation of the present great university which has grown from this small beginning. It is a curiously impressive event in our history to see this young clergyman—for he was only thirty years of age—come to a new country, give the money to found a college in the wilderness, and die the next year—as if his work were then finished, as it was, so far as this part of life goes.



In a story of destiny it is often curious to see how a certain group will be included among the dramatis personæ, each with



WHERE THE LANTERN SIGNALLED  
PAUL REVERE.

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the first church, on whose parson windows is still inscribed a covenant which was drawn up on October 10, 1633. The coming of Rev. John Cotton led to his being followed by one of his most devoted parishioners, a woman whose strong individuality impressed itself on the life of the colony. This was Mistress Anne Hutchinson, the Mary Livermore of her day. Governor Winthrop characterized her as "a godly woman and of special parts, who had lost her understanding by occasion of her giving herself wholly to reading and writing; whereas, if she had attended to her household affairs and such things as belong to women and had not gone out of her way and calling to meddle in such things as are proper for men, whose minds are stronger, she had kept her wits, and might have improved them usefully and honorably in the place God set her."

Mistress Hutchinson was as irrepressible as Lucy Stone or Susan B. Anthony, and she brought to bear a strong and determining influence. She was essentially a modern woman, three centuries in advance of her times. She had the same wonderful power to attract, to impress, to influence people and events that is so peculiarly held by Mrs. Livermore. Anne Hutchinson was a born mystic, a transcendentalist, and a holder of a belief not unlike that now springing up under many phases and names, everywhere recognized as that of the highest interpretation of spirituality. She believed in the direct intercourse between the individual and the Divine spirit, which the Puritan clergy held to be a sacrilege and a heresy. They regarded the doctrine of "inner light" as a peculiarly objectionable heresy, and when Mistress Hutchinson "claimed to have evolved a knowledge of the Divine will from her inner consciousness" they denounced it as blasphemy. She was a born social leader, and as the only life of that day was the religious—there being no newspaper, no dances, parties, theatres, concerts, or libraries—nothing but the Sabbath ser-

VICES followed by the church meetings and the Thursday lectures. Mistress Anne called together her woman friends ("females," in the quaint phraseology of the day), and preached to them, giving them an enthusiastic version of the Rev. John Cotton's latest sermon, with sundry original additions of her own. She became the fashion, the craze, the fad of her day. But the stern and narrow Puritan spirit rejected her; has not the world always stoned its prophets?—and after her banishment she betook herself with her family to the mouth of the Hudson river, in which region she was killed by the Indians, as is well known. Her home in Boston was on the site where the Old Corner Bookstore now stands.

The eighteenth century was a very important determining period in Boston life. Benjamin Franklin was born in January of 1706, on Milk street, his father's home being on the site now occupied by the office of the Boston Post. Cotton Mather, who had become a minister of the Second Church in 1684, died in 1728, but his influence permeated the entire century and it is, indeed, in the air today. In this great divine were united the names and the characteristics of the Mathers and the Cottons. His father was Dr. Increase Mather, pastor of the North Church and, later, president of Harvard. His mother was Maria Cotton, a daughter of the Rev. John Cotton. Cotton Mather was born in Boston in 1663, and, in the quaint phraseology of his biography, "when he was half a year short of nineteen he proceeded master of arts, and received his degree at the hand of his father who was then president." His tomb at Copp's Hill is the most noted one in the grounds, and the heavy slab of stone covering the vault where lie the bodies of the Rev. Drs. Increase, Cotton and Samuel Mather, bears simple inscriptions of names and dates. During this century Peter Faneuil gave to the city the hall now bearing his name; the first newspaper was founded; and the settlement presented the appearance of an active trading town. The cows were still pastured on the Common; but the social life held its rigid traditions of etiquette, and the ladies went their rounds in a chaise with one horse, attended by a colored servant, and in the early evening, after tea, for all Boston dined at mid-day, they walked on the Mall; and "those not disposed to the evening lecture" adjourned to one another's houses. Great regard was paid to what they termed "gentility." Their ideas of entertainment are typified by a record in Judge Sewall's diary, which runs:

"I went today to look at my vault. It was an awful but pleasing treat. Having said 'the Lord knows who shall be brought hither next' I came away."

Social rivalries were not unknown in these times. That sturdy patriot, Samuel Adams, said of John Hancock, whose display of wealth he indignantly denounced; "John Hancock appears in public in the state and pageantry of an Oriental prince. He rides in an elegant chariot attended by four servants in livery."

The Boston of Revolutionary days is so familiar in all history that it may here be passed with little reference. During those years the story of Boston was identical with the story of the nation. It was a vital part of the national progress and has become as familiar as the alphabet. The local patriotism was strong and fervent; and at the close of the war there set in a new era of progress whose trend became distinctively that of intellectual and literary culture.

In the early years of the nineteenth century there was born in Boston a group of the most remarkable men and women. The period of their activities is well named the "golden age" of Boston. Nor, indeed, can their names or influence be held in any local restriction. They belong to their country and to the world.

William Lloyd Garrison, who was destined to play so potent a part in national progress, was born in Boston on December 10, 1805. In his earliest youth he became conscious of that work to which he was divinely commissioned, not only that of the enfranchisement of the colored race, but of freeing his country from that "sum of all villainies," human slavery. The wealth, influence and social prestige of his native city were against him. Little did he consider it, for is not one with God a majority? In an obscure room up many flights of stairs this youth of nineteen set up the type of his paper, "The Liberator." He called meetings and proclaimed his message. The story of those days when Garrison, and Wendell Phillips, Lydia Maria Child, and the little band of brave reformers who gathered around them held their meetings in Boston—entering by back doors, leaving by circuitous routes, and literally taking their lives in their hands—is a subject for the tragic muse.

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Meantime newspapers were established; a railroad was built from Boston to Worcester and another projected southward to run through Dorchester, which brought out vigorous demonstrations of remonstrance. The residents of Dorchester declared that a railroad would be the ruin of business. Lney Stone, when talking of the opposition to woman suffrage, used often to relate with glee the indignant alarm felt by the people at the prospect of a railroad. "The cattle and the sheep grazing on the plains would be frightened to death," they said, "and the milk would be ruined." This curiously conservative element has always persisted in Boston, from the time of the remonstrance against a steam railway to that of the present season against a ten-story building on Copley square. There was a vigorous remonstrance against the slightest encroachment on the Common for the purpose of a needed thoroughfare in the rapidly growing city; there was a remonstrance against granting a charter to Radcliffe College (which, happily, did not prevent its being done); and remonstrance meetings of women, protesting against political duties, consume, apparently, more time and energy than all the political duties they could undertake in a lifetime.

erty transfigured by qualities of intellect and spirit; the other that of inherited wealth and its attendant refinement of external environment. The majority of men whose names are the glory of New England have belonged to the former. Dr. Edward Everett Hale says that his boyhood belonged to the time when a gentleman could do anything, and there was no task he might not ennoble. Emerson cut wood during his college life to assist his progress. Plain living and high thinking was a badge of culture. Again, there were those who were born in the purple—sons of inherited wealth, and among these were Wendell Phillips and Robert C. Winthrop. Independent of any necessity of earning a living, Mr. Winthrop had all his time to devote to the culture of his scholarly tastes. He belonged to a family whose name was one of the illustrious group of Bradford, Endicott, Winslow and Winthrop. His ancestry includes many eminent names. Robert Charles Winthrop was born in Boston on May 12, 1800, and graduated from Harvard in the famous class of '29. The achievements of his life were purely those of statesmanship, which differs very widely from politics—and as a statesman it is perhaps critically true that he barely missed greatness, or, at least, the



WHITTIER'S HOME—AMESBURY.

all over it in ten minutes." The great literary era was opening.

It will be remembered that a remarkable group of men and women were born within the first quarter of the nineteenth century. Edward Everett was born in 1794; Amos Bronson Alcott in 1799; Robert C. Winthrop in 1809; and within the next decade Hawthorne, Lydia Maria Child, Theodore Parker, Emerson, Margaret Fuller, Longfellow, Whittier, Mary Livermore, James Freeman Clarke, Dr. Holmes, Sumner, Dr. Benjamin Pierce, Wendell Phillips and other notable persons were born, and before 1825 Lowell, Whipple, Motley, Lucy Stone, Julia Ward Howe, Edward Everett Hale, Col. Higginson, James T. Fields, Abbe Morton Diaz, and, in the late years of the decade, 1830-40, were born Phillips Brooks, Louise Chandler Moulton, Louisa Alcott and T. B. Aldrich.

Not all these were born within the city limits of Boston, but all are, practically, Boston people, as this city was the general scene of their activities; but all, save Mrs. Howe, were of New England birth, and she is so identified with Boston as to be a part of its life.

A remarkable character among this unparalleled group was Hon. Robert C. Winthrop. He was almost the last of a distinguished type of New England life. There have been two distinctive and contrasting types of life here, each of which has contributed to the fruition of latter-day culture. The one that of material pov-

erty, Clay, Webster and Sumner have tame more purely national. Mr. Winthrop was all his life a conservative; with faultless taste, with intellectual power, with eloquence and elegance of address, with great charm of manner; but the one grain of magnetism—or of madness perhaps—that is required for greatness was lacking in his symmetrical character. Whatever the impediments, however, in his nature and temperament to the bringing a decisive influence to bear on the country at large, Mr. Winthrop was an ideal private citizen. His life was marked by scholarly pursuits in classic study, in historic research, and in literary enjoyment and appreciation; by a fine religious sense, by moral dignity, and by social grace. His home was a center of exquisite courtesy and gracious hospitality. On Washington's birthday, each year, it was his custom to receive every person, man, woman or child, who cared to come to his house. It was an occasion so unique as to live forever in the social history of Boston. The manner of Mr. Winthrop suggested the French nobleman. A nobleman of the Faubourg St. Germain might have received all Paris as Mr. Winthrop did all who in his own city came to greet him. He had two homes, a town house in Marlborough street and a beautiful estate in Brookline. They are both historic homes in which are gathered associations from the days of John Winthrop, his ancestor, and they abound in books, art and beauty in all forms.

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of Massachu-  
ed him. Yet

Mr. Winthrop was a communicant of Trinity Church and he was a warm and devoted friend of Phillips Brooks, who for over twenty years was his rector. He had been married three times. When the last Mrs. Winthrop died, some ten years ago, Dr. Brooks was in New York on the eve of sailing for Europe; but he returned and conducted the funeral services, sailing a week later. Little would anyone have then dreamed that Mr. Winthrop, who was already in his eighty-second year, would outlive his rector, who was some thirty years his junior.

Mrs. Julia Ward Howe, who, though a native of New York city, became a Bostonian by adoption, and one of the most im-

"These two gentlemen, Dana and Allston, were very intimate, and Mr. Dana had much to say concerning Allston's pictures, which he considered as far above the work of any painter of his time."

"It was Mr. Dana of whom Margaret Fuller said that 'he had the charms and defects of one whose object in life had been to preserve his individuality unprofaned,' was it not, Mrs. Howe?"

"Very likely," she returned. "The remark is applicable."

"Do you regard his estimate of Mr. Allston as one altogether merited, Mrs. Howe?"



LOWELL'S HOME—CAMBRIDGE.

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and Orthodox Congregational form of religion prevailed. The Episcopalian was scarcely prominent. Margaret Fuller was holding her 'conversations,' Emerson giving his early courses of lectures; some sort of musical society performed a Beethoven symphony.

"In the delightful general tone of society there was a decided flavor of culture. In fact, Boston had already won elsewhere a reputation for pedantic learning and blue-stockingism that it did not desire, nor deserve. Latin had formed part of the school education in good private schools, and Prof. Bach's residence here had introduced a good deal of Italian literature, so that the young ladies whom one met were often students of Virgil and Dante.

"Modern' languages were less spoken than in New York, in which place the possession of several languages had been considered a desideratum in education. People were studying German, but not very generally. Margaret Fuller and her pupils gave to it much attention.

"The social influence of Cambridge was more appreciable than now. Unless I am much mistaken, the society people in both places met more frequently than is now the case. The elder Dana, the poet, was living, and it was thought a privilege to meet and discourse with him.

"Mr. Allston was entombed—yes, I think entombed is the proper word," continued Mrs. Howe, smilingly, "in his studio in Cambridgeport, where only Mr. Franklin Dana, a man of eminent learning, possibly a few other intimates, knew the secret of entrance. People talked a great deal of his great picture, 'Belshazzar.' I remember that the fact of his unrolling it after many years was learned with deep interest. He began this great picture and left it unfinished. No doubt he did some work on it in his last years.

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his art, but concluded that the prophets and sibyls are for the Michael Angelos, the beautiful in Mr. Allston's dominion."

"Did you visit this exhibition, Mrs. Howe?"

"Yes, I remember we came over from New York to study its most important works. I think Emerson, in the portion of the life of Margaret Fuller written by him, describes how she saw what she desired to see, and made others read her own meaning into it."

"Had Theodore Parker begun to make his impress on the thought of the age during this period?"

"Yes, it was about this time that he preached that memorable discourse on 'The Transient and the Permanent in Christianity,' which was so very generally disapproved in the religious world."

"Did the social life differ essentially from that of the present, Mrs. Howe?"

"There was a certain reserve which characterized its hospitalities and general intercourse. In the Boston of that time the gentlemen of business did not go far from the city in the summer, and there were a number of very beautiful country seats in the neighborhood. Strangers coming to the city with proper introductions were invited to visit families at their country residences, on which occasions they were generally entertained with fruit and wine, the afternoon tea being then undreamed of.

"Nahant was the favorite seaside residence. The atmosphere of the city was quite distinctly recognized, it seems to me, as a little apart from the high road of business and fashion. The climate, perhaps, stimulated the nervous system, and generated an over-activity, which reacted on itself, not yet having found a vent beyond the narrow limits of old scenes and belongings.

"I first knew the city as a stranger—this quiet, formal, self-restraining Boston, but a little later, penetrating further into the spirit of the place, I found the fiery enthusiasms for art and let-



ters and reforms, out of whose development the best part of the modern Boston has come."

"You have certainly seen and studied the process of evolution that has resulted in the Boston of today, have you not, Mrs. Howe? Indeed, if it you might well say, 'all of which I saw, and part of which I was.'"

"I have lived, certainly," she replied, "to see a time in which rejected stones hewn and polished by God's hand, have come to be recognized as corner-stones in the practical religious buildings of the age. I remember when it was a discredit to hear Theodore Parker, and now how happy are they esteemed who have heard him. Brook Farm was once looked upon as a most amusing caricature. But when the world learned something about Hawthorne, George Ripley, William Henry Channing, John Dwight, and George William Curtis, the public heart bowed with remorseful homage before the ruined threshold of what, with all its shortcomings, was a blameless temple to ideal humanity."

Nothing could photograph more vividly the Boston of the period lying between 1840-70, than these reminiscences of Mrs. Howe.

There is nothing in all the city more typically Bostonian than the Athenæum, the library belonging to a private corporation of the stockholders, which is gathered in a classic brown stone building (erected in 1837) in Beacon street near Tremont. In it the portraits of dead and gone Bostonians look down from the walls and their busts stand on pedestals around three sides of the long gallery upstairs. The Athenæum is the surviving representative of the transcendental period, and holds in its atmosphere untold traditions and pictures of the great and gifted, whose special resort it was.

Henry James has laughed at the enthusiasm of the early Bostonians over the "attenuated outlines" of Flaxman who first represented foreign art to them; and the visitor of today cannot but smile to remember the serious devotion with which Margaret Fuller sat down day after day, before the few casts of sculpture and the paintings of Allston which were then in the Athenæum, to record her "impressions" of them in diary form. The Bostonians of the transcendental period took themselves very seriously. Chronologically, that period in its especial sense lay between 1830 and

by the German study and reading that took such hold on Margaret Fuller, James Freeman Clarke, Frederic Henry Hedge, George Ripley, Elizabeth Peabody and others in the decade of 1830-40. In the latter year "The Dial" was started; and there lies before me now, as I write, an autograph letter from Emerson to Elizabeth Peabody, without date, but necessarily written between 1840 and 1843 (as the Dial only lived three years), which runs:

"Can Miss Peabody oblige the Dial (just ready for extreme unction), so far as to send the first of these two proofs directly to the printers? On page 480 occurs the phrase, 'a dead leveller.' Is the phrase a considered one? I don't like the sound of it very well but it may be right."

Channing's influence was a potent one, reaching from the early years of the century; Theodore Parker also began to be felt as a great power about 1840; he was the Savonarola of his day. Thoreau and Bronson Alcott were unique personalities and a law unto themselves. "The acorn-eating Alcott," wrote Emerson of him to Carlyle, yet no one ever more fully appreciated another than did Emerson his Socratic neighbor. About 1840 the famous "Brook Farm" experiment was inaugurated, and its constitution stated its aim to be "to promote more effectually the great objects of human culture," and "to establish the external relations of life on a basis of wisdom and purity."

In 1841 Hawthorne wrote from Brook Farm to a friend:

"I have milked a cow. The herd has rebelled against the usurpation of Miss Fuller's heifer and whenever they are turned out of the barn she is compelled to take refuge with me. She is not an amiable cow, but has an intelligent face and a reflective cast of character."

Margaret Fuller was not so much, merely or even mostly, the literary woman, as she was a great force in life. Some one recently, in writing of her, asserts that she was not only the greatest woman of letters in America, but the only one who has ever produced work of any consequence. This had led, not unaturally, to contradiction, and the scale has been dipped even more extravagantly the other side by writers who seem to be devoid of any true recognition of her real greatness. A close student of profound original power, of a wide and exquisite culture, a thoroughly trained and philosophic mind, and a gift that can, perhaps, be described only as divination, made Margaret Fuller a supreme power in the forces of progress. But to point to her pub-

consisting of the "Summer on the Lakes," "The Drama," "Woman in the Nineteenth Century and Life Within," and "At Home and those books alone and claim that they sur-  
other woman of our country, is a claim that antiated. There is in her writings the qual-  
e is a power of spiritual insight; a depth and ough for which, indeed, too high apprecia-  
laimed. Yet, on the other hand, she lacked  
expression; and, in short, the true view of  
perhaps be that she was one of the greatest,  
t exalted spirits ever sent into this world.  
is a constant conflict with conditions, but  
opportunity gave her adequate scope for the  
rtial self. Her literary work, too, is the work  
l just after her fortieth birthday, and whose  
thirty was almost entirely occupied in teach-  
chievement, "The History of Italy," was lost  
ch swallowed up her life and that of her hus-  
garet Fuller was born in Cambridge on May  
a shipwreck off Fire Island, New York, July



EMERSON'S HOUSE—CONCORD.

1850; and the death of Margaret Fuller in July of 1850 marked a definite close to its activities, while its spirit permeates the air today

Transcendentalism was a spiritual impulse greatly stimulated

of the intellectual cult of that period, were  
outward life. It is authentically recorded  
e, having bought a broom, carried it home  
g across the Common, and that Julia Ward  
Motley, walked home from a ball. Mrs. Ed-

with F. Whipple was a pretty story of a visit of herself and her husband to the Hawthornes in the red house at Lenox, when Mr. Hawthorne and Mr. Whipple went out to the garden and picked currants for tea, and Mrs. Hawthorne made biscuit, while Mrs. Whipple laid the table. But were not currants and biscuit and tea a feast for the gods when the Hawthornes and the Whipples sat down to this nectar and ambrosia?

The poet Longfellow had married the daughter of a wealthy

house—Miss Frances Appleton—who was of the more formal social caste; although there were not then, any more than now, any very definite lines separating cults and cliques in Boston. There has always been great intersection among the social circles because the intellectual aristocracy is a recognized one, and during the past twenty years it is that which has held the greater social prestige. Still, the prestige of wealth and caste counted for something and the young and then unknown poet owed somewhat of widening horizon to his having married into a prominent family, although later they owed to him the larger claim for social prestige as his fame became world-wide. Mrs. Longfellow was a woman of great charm and of special literary culture, and the old "Craigie House" which they occupied added another to the literary homes for which Boston was the most noted city, at that time, in the entire country. Social life grew more elaborate in its entertainments in the Boston of 1850-60, and the anti-slav-

was called after her return from Europe, who introduced into Boston a much freer and fuller social life, giving her Thursday evening and Saturday afternoon receptions, serving tea and cake only—an innovation on the more formal customs that had prevailed in the city.

The Otis house was the center of brilliant social life and to Mme. Otis strangers of rank and distinction invariably brought letters. It is to Mme. Otis that is due the making Washington's birthday a legal holiday. For years on that day she opened her house for a public reception. The spacious rooms were decorated with the national colors; filled with flowers sent by friends, and all day long the throng of citizens, high and low, rich and poor, poured through its portals, each welcomed with that high-bred grace which so distinguished her.

With the exception of the great Mary Livermore and of Kate Field, no woman of this country was ever, perhaps, so ardent a



LONGFELLOW'S HOME—CAMBRIDGE.

ery excitement flamed, and to a great degree dominated other interests.

And then the Civil War came on, and there arose a remarkable woman. A grande dame of society came to the front, Mrs. Harrison Gray Otis, who took entire charge of the work of the sanitary commission in Boston. Mrs. Otis was the daughter of a wealthy China merchant—the species of mercantile activity in which the great fortunes of Boston were largely made—and she had received the most extended education and exquisite culture that the best masters and opportunities for travel and society could give. While still a young girl she made a brilliant marriage, the Otis family standing among the highest in the land. Her husband died in their early married life, and she took her four young sons to Europe for their better education in art and languages. She was herself an admirable linguist, speaking four or five languages, and she had been presented at half the courts in Europe, and had a social distinction which she took naturally—she had been born to it—and she was withal, the most ardent patriot.

The Otis mansion was on the corner of Joy and Mt. Vernon streets, and is now extended by several stories into the air, and known as the "Gray Chambers." It was Madame Otis, as she

patriot as Mme. Otis. She assumed charge of all the goods and money for the sanitary work in Boston, and for three years she never missed a single day of being at her post in the large building on Tremont street, from ten to three, save on Sundays and holidays. She established a "Bank of Faith" for voluntary contributions, and over one million dollars, not one penny of which was solicited, flowed in. While her work had not the marvelous scope which characterized Mrs. Livermore's during the Civil War, as Mrs. Livermore's was national and that of Mme. Otis restricted to the New England states, it was of the same generous and noble quality which so signally immortalized that of Mary Livermore.

The literary homes of Boston were a signal feature of the city. The home of Prof. George Ticknor, the Spanish historian, stood on the corner of Park and Beacon streets, and there for forty years a splendid and gracious hospitality prevailed. After fifteen years at Harvard, Prof. Ticknor was succeeded by the poet Longfellow, and in 1835 he went abroad with his family, remaining four years and sharing the social life of courts and nobility. It was at the Ticknor house that Lafayette was entertained when in Boston, at a little Sunday night supper which



Prof. and Mrs. Ticknor gave for him, and which is still famous in Boston annals. It included among other guests, President and Mrs. Quincy, of Harvard, Mr. and Mrs. Daniel Webster, and Mr. Prescott. Previous to 1840, very few Bostonians left their homes for the summer; but the Ticknors always went to Nahant or Portland to visit the Prescotts at their country house at Pepperell; and later the custom of having a summer home became more general. Mr. Longfellow had a cottage at Nahant; Mrs. Julia Ward Howe a country house near Newport, where one day, when Tennyson's poem, "In Memoriam," first appeared, George William Curtis and Charles Sumner journeyed to Newport to Mrs. Howe's home to read, with her, the wonderful new poem that moved a nation.

Fashion never enthroned herself in Boston to the degree in which most cities have given her tribute. The genius loci was unalterably polarized toward other aspirations than those represented by chiffons. An amusing and typical instance of this spirit was recently related with glee by the victim of the joke. With the moral zeal of the true Bostonian, a lady remarked one day to her maid that external adornment was of very little value and that she herself did not rely at all upon her clothes.

It is difficult now to even faintly imagine the excitement that this parody on Poe produced on its appearance in an evening paper.

One of the charming features of the literary Boston of the scarcely vanished past, was that of the Sunday evenings at the Whipples' during the lifetime of the gifted critic. Here was something more like the salon than is often seen in these days. Mrs. Whipple's exquisite tact, as well as her fastidious taste, drew a circle at once eclectic and exclusive—guests drawn together by the only true law, that of spiritual gravitation. In the golden age of Boston it was Lowell and Longfellow and Greene and Pierce and Emerson; Dr. and Mrs. Howe; the Alcotts; Mr. and Mrs. Fields; the Hawthornes; Ole Bull and his graceful wife; Edwin Booth, and the witty Autocrat; Dr. Bartol, the gentle mystic; James Freeman Clarke, serene and spiritual; Miss Anne Whitney, of an almost classic majesty of presence; the winning and gracious Louise Chandler Moulton, whose poems charm a multitude of readers; Miss Lueretia P. Hale, and in still earlier days, Sumner and Governor Andrew.

Wendell Phillips went little into society. There was no house but that would have felt itself honored by his presence, but he



LONGFELLOW'S STUDY.

"And what was inimital

In the de- feature in weekly Mon

T. Sargent, in *Chestnut Street*. It was the most intellectual galaxy that America has ever seen. Here assembled Emerson, Longfellow, Lowell, Whipple, Alcott, Dr. Hedge, John Weiss, Thomas Starr King, Whittier, Mrs. Livermore, Julia Ward Howe, Garrison, Wendell Phillips, Lucy Stone, Mrs. Moulton, and many others of the lights of the day. Sherwood Bonner (Mrs. Katherine McDowell) being invited to one of its meetings, quite transcended the privileges of a guest by writing a parody on "The Raven," but at a quarter of a century's lapse of time one is disposed to look leniently on the discourtesy, because of the wit. It opened thus:

"Dear friends, I crave attention to some facts that I should mention  
About a club called 'Radical' you haven't heard before;  
Got up to teach the Nation, was this new-light federation,  
To teach the Nation how to think, to live, and to adore;  
To teach it of the heights and depths that all men should explore,  
Only this and nothing more."

Mrs. Julia Ward Howe was thus characterized by this audacious rhyme:

"Then a lady fair and faded, with a care-worn look and jaded,  
As though she saw the glory of the coming Lord no more,  
Crushed the British lion's roaring by a reverent outpouring  
Of a faith forever soaring unto heaven's golden door;  
She was listened to intently by each member on the floor,  
For her genius they adore."

cial work for human- de a certain sacrifice e light of duty. ipples, and his most was written from a ipples by Sumner.

A poet of rarest gifts; a student whose rewards were rich and noble in the directions he pursued; a man of fine and exquisite tastes, of delicate sensibilities was Dr. Parsons. As a literary man he ranks among the few of our greater authors; he found his peers with Lowell, Whipple and Longfellow. As a scholar, with Prof. Charles Eliot Norton. His translation of Dante is one with genuine claim to perpetuation in literature. His poems, comparatively few in number, hold sacred fire. On his altar burned the living coal.

In his chair of Belles-Lettres at Harvard, Prof. Norton has impressed upon successive classes of students an understanding and a reverence for the fine arts and for poetry and the higher literature. To attend his lectures was in itself considered by Harvard students as a liberal education. His distinction of manner, his charm and graciousness, and his sincere and unaffected interest in the individual welfare and progress of the students won their entire confidence and commanded their admiration, and his recent retirement is greatly regretted.

The eminently conservative character of Lowell's mind is indicated by a remark made in a letter to Mrs. Howe more than thirty years ago. It was during his editorship of the *Atlantic*, and she had sent him a poem, which he declined with the asser-

tion that no woman could write a poem, and that Mrs. Browning's efforts were a conspicuous illustration of her failure to be a poet. Mr. Lowell added in this note to Mrs. Howe that he would gladly accept a prose article from her. There is no question but that Mr. Lowell was always under the old order of things, believing that the woman was subservient to the man.

Mr. Lowell had the ethical radicalism of the moral enthusiast and the social conservatism of his age and generation.

In August, 1860, Lowell wrote to Hawthorne a letter introducing Mr. Howells, and here is the picture he drew of the great novelist thirty-eight years ago.

"He wants to look at you, which will do you no harm, and do him a great deal of good. His name is Howells, and he is a fine young fellow, and has written several poems in the Atlantic, which of course you have never read because you don't do such things yourself and are old enough to know better."

Mr. Lowell will be remembered as the poet and man of letters who became a citizen of the world. Wherever literature is loved,

life, were his, and its vitality was shed upon thousands of other lives of those who yet never clasped his hand or looked upon that keen, joyous, thoughtful and spirituelle countenance. Fame crowned him at many of her portals, and honor, troops of friends and showers of good wishes brought their tribute. He built him yet "more stately mansions" as the swift seasons rolled, and he represents to us all that is noblest, most generous and harmonious in the literary history of America. His home "on the water side" of Beacon street was a hospitable one. His library was on the second floor looking out on the Charles river, and here, in the closing years of his life, he received his friends sitting enthroned among his books. In the drawing room down stairs hung the famous portrait of "Dorothy Q" with the British officer's sword thrust through the canvas. Both Dr. Holmes and Mr. Lowell led very ideal literary lives when one comes to think of it. The conditions into which both were born were the best possible for literary development of a high order, and each was fortunate in what was withheld as well as in what was given.



THE OLD MANSE—CONCORD.

wherever patriotism is held as a pious virtue, wherever human progress is seen as an individual and national ideal, the name of James Russell Lowell will be enshrined.

Other phrases are needed to characterize Dr. Holmes. He had the most electric personality, recognizing with the lightning swiftness of intuition the keynote to any scale of elective affinities. He was not so much magnetic, as magnetism impersonated. He was so much more alive than other people. The term "old age" was a misnomer to associate with the genial, brilliant Autocrat. The waters of Helicon were to him the fabled spring for which Ponce de Leon sought in vain, and it might have been said of him in his last days, as truly as when Lowell wrote the lines fifty years ago:

'His are just the fine hands, too, to weave you a lyric  
Full of fancy, fun, feeling, or spiced with satiric,  
In a measure so kindly you doubt if the toes  
That are trodden upon are yours or the foes.'

Poet, wit, scholar, romancer, critic and scientist, surely nature was in a bountiful mood when she crowned with all her gifts his beaming and benignant life. The sunshine of all the summers since that auspicious 29th of August, 1809, sifted into his

Mr. Lowell always reverted with love to his early home, one of pure and lofty ideals with modest competence and inspiring associations. Rev. Dr. Charles Lowell, his father, was a typical early New England divine, in whom great and genuine goodness was a distinct and positive genius. Mrs. Edwin P. Whipple has related how Dr. Lowell was often seen at night with his lantern, traversing the muddy and crooked paths of the poorer parts of his parish, seeking out those in need of a word, or of material aid. Rev. Dr. Bartol, the venerable transcendentalist, who, at the age of nearly ninety, is still in fairly serene health and activity, was the junior colleague of Dr. Lowell in the pastorate of the Old West Church.

The mother of James Russell Lowell was a woman of sensitive and poetic nature, and of imaginative power. A student curious in tracing heredity would perhaps ascribe her son's poetic gift to the strain of romance in her, coming as she did, from a family in Orkney, with the wild picturesqueness of its life in her temperament. Elmwood, the home of the Lowells at Cambridge, is well known to all students of our literary history. It is a pleasant, unpretentious house, with elms in front, looking over the east side of Mount Auburn cemetery at the back. Two drawing-rooms—if so stately a name could be applied to them—are on



one side of the hall, with doorways on either side the fireplace, connecting them. Mr. Lowell's library was the front room on the second floor—a library rich in classics and rare volumes. The estate is still in possession of members of his family.

The home of the poet Longfellow on Brattle street, in Cambridge, is always a shrine of pilgrimage. The old "Craigie House" it is still called, and there Miss Longfellow, the eldest and the only unmarried daughter, lives, while on either side the two married sisters, Mrs. Dana and Mrs. Thorpe, have built their pretty houses—all on the same lawn. Mrs. Thorpe (Annie Longfellow) married a brother of Mrs. Ole Bull, and Mrs. Bull, who for so many years occupied Mr. Lowell's house—Elmwood—has now built a house of her own on Brattle street, very near the Longfellow estate, and a house that is one of the most luxurious and elaborate in modern New England architecture.

Boston is especially fortunate in her neighboring towns easy of access, beautiful to know, and of all these Concord is the one most enshrined in the classic associations. The spirit of the town in keeping green the memory of its world-famed citizens is admirable. The Fitchburg road (the route to some of the most charming and picturesque scenery in all New England) has such admirable train service to Concord that one finds it easier to go than to stay at home. Trains convey one from Boston to Concord at almost any hour of the day in from thirty to fifty minutes, and reaching the little station the first thing that meets the eye is Thoreau street. Instantly one feels in the atmosphere of classic association. The beautiful town library, its interior lined with the busts of "Concord authors"—Emerson, Hawthorne, Thoreau, and the Alcotts—with others of fame, is a grateful expression of the enthusiastic devotion with which the village cherishes its great and its good. A little walk past an old graveyard, whose moss-grown stones bear dates of two centuries ago, brings one to the public square wherein the soldiers' monument stands, and from which two roads branch, one on which stands the home of Emerson, and still farther on the "Orchard House," and "The Wayside," and another from which one approaches "Sleepy Hollow" cemetery. It is here that one makes his pilgrimage. Here is the spot that is as much a classic in the world's history as the famous region of the lake poets in England, or the heath where the witches appeared to Macbeth, or the spot in Florence whereon stood the house in



LOWELL'S STUDY.

which Dante lived. For the name of Emerson is second to no other in the entire history of the world, and his grave will be forever a shrine of sacred pilgrimage.

In the calm beauty of a golden summer afternoon, climb the sloping heights of "Sleepy Hollow". Approached from the main thoroughfare (on the south) the roads and paths wind upward over varied slopes.

Emerson's grave on the crest of the highest hill in Sleepy Hollow cemetery, is only twenty minutes' walk from the station.

If one chooses he may drive; but in that he misses the pleasure

of sauntering through the town, with its wealth of historic associations. One may like to walk leisurely past the house where for some years Mr. Alcott lived with the family of his married daughter, Mrs. Pratt. The home of Judge Hoar and the old graveyard are on the main street of the village. The home of the well-known author, lecturer and political economist, F. P. Sanborn, is at the west end of the town, on the river. Mr. Sanborn went to Concord the year that he graduated from Harvard, and here he has lived, the neighbor and friend of Emerson and of Alcott, during their lives, and he has always been actively engaged in the life of literature and reform. Aside from Mr. Sanborn's home the chief interest of Concord is at the east end of the town. From



CUSTOM HOUSE—SALEM.  
(Where Hawthorne Wrote the Scarlet Letter).

Monument square three roads fork, branching in different directions; on one of these is the "Old Manse" which was built in 1765, for Rev. William Emerson, the grandfather of Ralph Waldo Emerson. Mr. Emerson married Phoebe Bliss, the daughter of a clergyman, and died a few years afterward. His widow became the wife of Rev. Dr. Ezra Ripley, who, in 1778, planted the apple orchard that still stands, extending back from the house to the river. Almost all the old ministers of New England have been entertained under the roof of this ancient house. The small, square study, where so many sermons have been written, and where the traditional ghost used to appear, is still kept as it was a hundred years ago, and it is said that still, late at night, the door-latch is lifted and the door opened by an unseen hand. In the rooms above the dining-room Emerson wrote his "Nature" and Hawthorne his "Mosses from the Old Manse". In another chamber (called the "Saints' Rest") the walls bear written inscriptions from many of the aged priests who have slept there.

The home of Emerson, a modest white house with great chestnut trees guarding the gate, is now that of his daughter, Ellen, who has never married, and who is a household saint in Concord. Emerson's library is kept as he left it, and in the dining-room hangs a classic engraving which was Carlyle's wedding gift to Mrs. Emerson.

The grave of the great mystic and poet, in Sleepy Hollow cemetery, is marked by an immense boulder of rose quartz. A bronze tablet bears the inscription:

RALPH WALDO EMERSON  
Born in Boston, May 25, 1803  
Died in Concord, April 27, 1882.  
"The passive mother lent his hand  
To the vast soul that o'er him planned."

By his side lies his wife, and the grave of the little son, Waldo, in whose memory he wrote the "Threnody," is next his own.

Almost adjoining are the lots wherein lie Hawthorne; the Alcotts, father and mother and four daughters; Thoreau and Emerson. Three generations of the Emersons are buried here, and the various inscriptions recall curious bits of local history and tradition.

Another name which was a vital part of Boston, Boyle O'Reilly, can now be read only in the hearts of the people, and on the beautiful sculptural memorial by French, placed at the head of Boylston street in the Back Bay Park. Mr. O'Reilly was peculiarly and pre-eminently a man of large relatedness, if one may so

call it, to life. Not only in his natural and inevitable relations to a large and complicated business, to his family and nearer friends, and to general society, but to all humanity. No person could be so obscure, or so degraded, or so utterly outside the pale of what might seem some use in life, as to be outside the



WHITTIER'S HOME—DANVERS.

active sympathies of Boyle O'Reilly. If one were in need, that was all the passport required to his sympathy, his counsel and his assistance. He left the deserts to be judged by the All-Seeing, and asked no credential of those whom his goodness benefited.

Although there is a new Boston, a greater Boston, indeed, a new Boston of modern architecture and taste, yet there still abound the old-fashioned houses whose exterior suggests to the passer-by nothing of the beauty within. Of these are the houses of Robert Treat Paine, ex-Governor Claflin, Mrs. Whipple, Mrs. Fields, Rev. Dr. Bartol, and the late Mrs. Hemenway. With all her vast wealth she lived in a house on Mount Vernon street, of which the only particular impression the passer-by would gain would be that it must be a "roomy" mansion. Ten chances to one, indeed, if the casual pedestrian even noticed it at all. Yet within it was a home fit for culture and high taste. That is what one would have said on entering it. One would not have thought: "This is a fitting home for a woman of fine tastes and high life"—high life in Boston not meaning precisely what it does when the term is used in Punch. Noble works of art, paintings, sculptures, books, adorned Mrs. Hemenway's spacious and beautiful house where extensive and charming hospitalities prevailed, and where all that could minister to the finer flavors of life were gathered for comfort, for use, but in no sense for display.

A French visitor in Boston solaced himself by writing a book about the social life of the modern Athens in which the quality of frankness, at least, cannot be said to be lacking. He found Boston society provincial and said so. He alleged that most interesting and important people are not "in society," and that the alleged "smart set" comprise a few families who entertain each other, and marry each other continually, and whose companionship is as devoid of inspiration as possible. The arraignment is a formidable one, and it is, at the worst, very cleverly made. The question is, is it true? When the assertion is made that the most interesting and important people are not "in society", one cannot but recall the old truism that where MacGregor sits there is the

head of the table. In those gatherings where President Eliot, Dr. Hale, Mrs. Howe, Dean Hodges, Dr. John Fiske, Prof. Josiah Royce, Mrs. Whipple, Mrs. Agassiz, and others of representative people who stand for something—in those gatherings where they are to be met, is there not "society", and the best of it? Why must social life par excellence be regarded as a matter of spectacular festivity? Why is not a quiet dinner, or reception,

more thoughtful or gifted order of a Bradley-Martin ball? "Society of humanity," well said Kate Field; "some days it will be." Not only should we assist at the prophecy, but also admit that "society" is merely a life of representation—in dining and in the standard of life.

Wealth in Boston does not seem to be as beautiful as dinners; there are beautiful toilets, there is charm—what you will—but those are not used by it. There still lingers in it is not to be mistaken for provincial standard in Boston is that of an ideal carried to what it is sometimes insisted upon to enter within the gates calls narrowness is standard is held high and so absence to all social relations.

Whittier's wealth in Boston does not seem to be as beautiful as dinners; there are beautiful toilets, there is charm—what you will—but those are not used by it. There still lingers in it is not to be mistaken for provincial standard in Boston is that of an ideal carried to what it is sometimes insisted upon to enter within the gates calls narrowness is standard is held high and so absence to all social relations.

Trinity square, is open every day and is always a place visited by the tourist and stranger. The Museum of Fine Arts and the Public Library, together with Trinity and the "Old South" Church, combine to make Copley square the architectural representative of Boston. Trinity has been most fortunate in securing for its rector—the immediate successor of Phillips Brooks—the Rev. Dr. E. Winchester Donald, a man not less remarkable than his celebrated predecessor. His philosophic



WHITTIER'S STUDY—DANVERS.



breadth of thought, his noble culture, his sympathetic and winning personality, render Dr. Donald one of the salient forces in the life of the Boston of today.

Any attempt to portray Boston that did not include the name of Rev. Dr. Edward Everett Hale would be, indeed, the play of "Hamlet" with Hamlet left out. As a great divine, an eminent man of affairs, a noted counsellor in all municipal interests; the friend, the citizen; no less, also, one of the most widely read of the Boston authors, Dr. Hale's personality and influence are unbounded.

The Public Library in both its intellectual and artistic aspects is more and more the center of interest. Its mural paintings rival in interest the galleries of the Museum of Fine Arts; its stately and noble reading-rooms, Bates Hall, the periodical room, the newspaper room, the fine arts room and other departments and specialties; its active hospitality, its beauty, glow and charm, are simply magnetic. Too much could hardly be said of the unvarying courtesy, the helpful kindness of Mr. Knapp, curator of Bates Hall, and of the heads of the other departments in the delivery room, the periodical and newspaper rooms. Yet with every recognition of the very rare quality of Mr. Putnam's staff, in their various responsible positions; with every recognition of the spacious, splendid buildings—a dream of beauty without and within—one must come back to the center of it all; to him whose firm touch upon the mainspring holds its elaborate mechanism true to its course—the Librarian, Herbert W. Putnam. The splendid building, with all its treasure of literature and art, might almost relapse into a mere literary mausoleum were it not for the spirit that informs it with life and light and irresistible energy.

The Lowell Institute is another important institution of learning in Boston, being, indeed, a "People's College". John Lowell, a son of the man for whom the city of Lowell was named, died in Bombay in 1836, at the early age of thirty-nine, and he left half of his fortune (\$237,000) to found a course of annual lectures on natural and moral science, political economy and literature, to which, after putting aside ten per cent of the income of this fund, each year, the remainder of the income should be devoted. Mr. Lowell wisely provided that no part of this fund should be devoted to building purposes. Not the external appliances, but the inner significance, was his aim. The Lowell Institute (whose lectures are given in Huntington Hall of the Institute of Technology) was opened by Edward Everett on December 1, 1839, and during the sixty years of their course the lecturers who have appeared on this platform have represented the most eminent men of various nations, in science, ethics, political and social economy.

The traditionally crooked and intricate ways of Boston are only objectionable to the un-Bostonian mind. It is the barbarian who dwells afar from the Frog-pond and out of sight of the Gilded Dome who demands unerring rectangles in his thoroughfares. (If the Gilded Dome were within his range of vision, he wouldn't be an outer barbarian, of course.) The Mayflower-landed, colonially-descended intellect regards a blind alley with the respect that Mark Twain's guide gave to "Ze great Christopher Colombo". No wandering minstrel from afar need ever feel that Boston has really taken him to her heart—oh! no, her mind—until he is initiated into the mysteries of the alley, whose holes and escapes, so to speak, are the joy of the Bostonian heart, and the delight of the Bostonian feet that skip nimbly through them after the native custom of jugglery.

Now, to the outer barbarian that all but invisible passage from Washington street to the locality ambitiously termed "City Hall avenue," via Young's Hotel, is a "route obscure and lonely." (No, there is no intention of adding the succeeding line that Poe added.) But the native modern Athenian rejoices in this byway. He darts through it at the rate of a mile a minute, and dodges his fellow Athenians on the way with the celerity and an agility that is no less admirable than it is startling.

Again, does the initiate wish to go from the middle of School street to the middle of West street? The stranger within the gates would take the long and decorous route on either Tremont or Washington; but the man to the manner born sagaciously betakes himself through the alley by the Parker House, emerging at Bosworth street; nimbly skips down the stone steps back of

Horticultural Hall, into another truly Bostonian passageway, crosses Bromfield street, hies him into Bromfield court—an Italian settlement dropped into the heart of Boston—makes a thoroughfare of a business house opening on both streets, and arrives at his destination in a hop, skip and jump fashion that is highly edifying. It is a picturesque mystery dear to the Bostonian heart, and on no consideration would he exchange it for prosaic rectangles.

Boston, like Paris, has her Quartier Latin, where the most interesting things happen. There is a semi-Bohemian region in which are located several studio buildings and other artistic or semi-literary headquarters, which is a part of the city that is very much alive. On the new land, the buildings all new, it is yet adjacent to and adjoining the old part of the city. It is not far distant, geographically, from the fashionable portion; it is within a half dozen blocks of Commonwealth avenue, of Beacon



BATES HALL.—PUBLIC LIBRARY.

street; but while these thoroughfares are monotonously quiet, with the decorous rows of private residences, broken now and then by an apartment hotel that vies with palaces in luxurious fitting-up, this artistic Latin-like quarter abounds in students who pour out of its clubrooms or restaurants in great numbers; with artists, men and women, who perhaps live in their studios, make their matutinal coffee over a gas stove, and dine at the students' restaurant; in lecturers; in the followers and practitioners of occult science, and mental healing; in spiritual mediums—what you will. You will perhaps be accosted on the sidewalk by a neatly dressed woman with refined courtesy of manner, who offers you a card bearing the legend, "Divine Science Home." You may be favored with a gratuitous copy of "The Prophetic Star-Gazer;" you may be gently entreated to attend a lecture on the "Science of Creation from the Standpoint of Vibration;" or invited to a course on "Psycho-Physics;" you may be asked if you understand "mental chemistry;" you may be informed of the private lectures given by Siddi Mohammed Tabier; you may be privileged to enter into the mystic atmosphere of the "Oriental Circle," where you listen to discourses on the "Gods of Egypt and the Book of the Dead;" "The Mahabhrata and the Ramayana," or "Reincarnation of the Vedas." Lecturers in this quarter discuss such topics as "Primal Force," "The Bondage of Mortal Sense," and "What is Death?" A daintily gowned young

woman sitting in a club parlor in this region was asked if she believed in thought-transference. "O, I am far beyond that," she replied airily; "I am in the sphere of intense vibration." There is one house where its fair mistress proclaims herself "Daughter of the Druids," and where she gathers a circle of the faithful about her on afternoons and lectures to them on "Symbolism." She has a room fitted up with maps and charts of the most extraordinary description. The signs of the zodiac; the supposed aspect of the universe at different periods of creation; representations of the stages of evolution in man, and other strange signs and designs of which it is difficult, alas, to grasp the meaning.

All this is the picturesque region of Boston. It is very much alive and is, indeed, "an atmosphere of intense vibrations." Here congregate artists to whose mind views on Impressionism and Realism constitute a legitimate *causis belli* over which they

limitations of space. The hall was crowded with eager listeners, and the power of Mrs. Eddy revived the memories of Anne Hutchinson and made itself a part of the apostolic succession of fervent idealism which is inseparable from Boston life and which is its dominant characteristic.

A remarkable factor in the development and progress of Boston has been the work done in the Institute of Technology. This institution, which General Walker well insisted should rank with Harvard University in educational importance, has made itself a centralizing force in scientific progress and intellectual advancement in every direction. Huntington Hall is used for the Lowell Institute lectures as well as for the special work done in the Institute of Technology, and the great audiences that gather every season at the Lowell Institute courses are the most visible link between the old and the new periods in the history of Boston.



HAWTHORNE'S HOUSE—CONCORD.

wrangle as the elder theologians of New England did over "original sin" and "foreordination."

An unique feature in Boston is that of the "First Church of Christ, Scientist," in the Back Bay; the first church in the world to be erected by the sect of that name, and which holds as pastor the Rev. Mary Baker Eddy, the founder of the sect which had its origin in Boston. The auditorium seats some fifteen hundred.

The rise and progress of this sect has been a curious feature in Boston life; its inception being the Sunday afternoon meetings of about a dozen people held in a parlor, in 1877-78, when Mrs. Eddy first entered on her work here. Three or four years later she founded her "Metaphysical College," where she gave morning lectures to an audience, often numbering three hundred—at the rate of one hundred dollars for twelve lectures, and many were turned away or obliged to wait on account of the

The new Boston, architecturally and geographically, is as impressive on one side as is the new thought, customs and general life on the other. All that part of the city lying west of Charles street has been literally "made" by filling in the land, within the memory of men still living. Indeed, in the year 1880 Dartmouth street was the western extremity of the city, and it is almost incredible that the miles of noble and beautiful architecture beyond and the spacious splendor of the Back Bay Park, with its chain of thirty miles of driveway, the most splendid park system of America, is the growth of the past eighteen years.

"Sweet records, promises as sweet," are words that recall themselves to one in contemplating the story of Boston; the city founded in prayer and nurtured in faith and aspiration; the city of ideas and ideals; the growing center from which radiates that energy and power which well entitles it to be called the Athens of America.



## THE BOSTON ELEVATED RAILWAY COMPANY.

## A MODEL ROAD.

Of the many attractions of the city of Boston, the "suburbs" are perhaps the chiefest. Hardly any city in the United States is so fortunately situated. The man of business can with ease leave his office in the center of the city and within 15 to 30 minutes be at his home in a place surrounded by trees, by the seashore, or in the midst of farming land, where it is hard to realize that a great city is within so short a distance. Nothing has had more to do with bringing about this possibility of suburban homes than the system of street railways, which is one of the finest in the country.

When one considers the geographical situation of Boston this statement seems surprising, for there is hardly a city in the



WILLIAM A. GASTON,  
President.

United States where the street railway business is conducted with more difficulty. Boston streets are proverbially narrow and crooked, and there are very few main thoroughfares. The ordinary winters are most severe. Supplies cost more than in other cities and the rate of wages is higher. The public expects and demands a higher grade of service than is given in most places. But in the face of all this Boston has, with one exception, the largest street railway under one management in the country.

The Boston Elevated Railway Company controls all the street railway lines in Boston and 10 other cities and towns in its suburban district. These cities and towns have a population of 782,845. The mileage of surface lines is 305, all of which are operated by electricity, except 2.8 miles. To operate this vast system seven power houses for generating the electric current are required. There are 2,648 cars and 5,100 employes. Last year 196,332,239 passengers were carried, of which 172,554,513 were revenue passengers and 23,777,726 were free transfer passengers. The passenger earnings were \$8,536,285.83 and the operating expenses were \$6,213,708.56.

The Boston Elevated Railway Company took possession of the property of the West End Street Railway Company October 1, 1897, under a lease for 25 years, and is making preparations to build elevated lines on plans now under way and to be completed at an early date.

The history of street railroading in Boston dates back to 1856. Previous to that time all the bridges leading into Boston were toll bridges and many of the roads leading into the city were turnpikes on which tolls were charged. Between Boston and

Cambridge there was a regular line of omnibusses running every half hour during the busy part of the day, but at other times the service was uncertain and irregular, the vehicles often becoming stalled in the muddy streets. The service between Boston and other suburban towns was no better. It is difficult to realize that within the comparatively brief period of 42 years such a complete revolution has taken place. It is not too much to say that the street railway has been a great factor in completely changing the habits, conditions and civilization of the community. It is the street railway that has made suburban Boston possible.

The Cambridge Railroad was the first street railway to be operated in Boston. At the time that the first car ran, March 26, 1856, the company had under construction 10 miles of single track. When the line was opened for traffic five miles were operated. The rail used at that time weighed about 60 lbs. to the yard and was of the groove head pattern. The gage was the standard. The car equipment consisted of 10 box cars with 16-ft. bodies, built by Eaton, Gilbert & Co., of Troy, N. Y. The company owned 165 horses when the line was opened. These were purchased from the company which operated the omnibus line, it having sold out its entire business to the street railway company. The cars ran from the corner of Pearl and Main streets, Cambridgeport, to Cambridge street, Boston, a distance of about two and one-half miles. The hours were from six in the morning until eleven at night. The fare was 8 cents. About the last of April, 1856, the line was opened to Harvard square, Cambridge, increasing the length of the line three and one-half miles and the fare was increased to 10 cents. For its first year's work the company carried over 1,000,000 paying passengers.

In September, 1856, the Metropolitan Railroad Company opened a line from Boston to Roxbury and in its first year carried 8,000,000 paying passengers. It immediately became apparent that



OFFICE BUILDING OF THE BOSTON ELEVATED RAILWAY CO.

there was a demand for local transportation facilities larger than anyone had supposed. The success of the Cambridge and the Metropolitan Railroads led to the construction of new lines by them and the extension of the lines already in operation. Other corporations were formed and opened territory adjacent to those in operation, and others were established as competing lines. At one time there were no less than 18 different companies, each operated separately. There seemed to be an epidemic on the subject, and the value of a street railway franchise was greatly exaggerated. Numerous charters were obtained which were never used and many small roads were built long in advance of any sufficient demand to justify their cost.

After a time, however, consolidation brought the number down to five. These were the Metropolitan, the South Boston, the Cambridge, the Highland, the Middlesex and the Lynn & Boston companies.

The Metropolitan Railroad was the largest and carried the greatest number of passengers. The Highland was of the greatest benefit to the community. Its management introduced a much better style of car than had ever before been used in Bos-



SAMUEL LITTLE,  
President West End Street Railway.

ton. Great care was exercised in selecting polite and competent employes and they were the first to appear in uniforms. Many of its lines paralleled those of the Metropolitan Railroad and in some cases its cars ran over the tracks of the same road. The cars were always kept clean and neat, inside and outside, and when one could get to his destination as well by one route as another the Highland was the one chosen.

A large share of the credit for Boston's famous park system is due to the Highland Street Railway. The first link in the chain of the great park system was West Roxbury Park, later Franklin Park and now Franklin Field. That portion of the park was near the end of the Highland Railway's line at Grove Hall, Dorchester. The company extended its line to what is now the entrance to the park near Oakland Garden, and by influence brought to bear upon the city authorities, aided by public opinion, was instrumental in the purchasing of the land by the city.

The Highland Railway was consolidated with the Middlesex Railroad under the title of the Boston Consolidated Street Railroad.

In 1886 two street railway companies were chartered under the general laws, the incorporators being the same men. These roads were known as the West End and the Suburban. The original incorporators started as a land company, with the idea of uniting Beacon street (Brookline), and Beacon street (Boston). In Brookline the intention was to widen that part of Beacon street into a boulevard and in this way increase the value of the land. It was also planned to have street railway tracks in the center of the boulevard which would run into Boston over Beacon street and connect there with the rails of the Metropolitan Railroad Company. This road was known as the Suburban.

The general consolidation of the street railways of Boston took place November 11, 1887. The originator and leader in the matter was Henry M. Whitney and he became the president of the West End Street Railway Company, the result of the consolidation. It was mainly through him that Beacon street was widened and that the controlling interest in each of the Boston street railways (except the Lynn & Boston Railroad) was purchased. As soon as the consolidation was completed it was seen that some new system of motive power must be adopted.

There were at this time 1,584 cars, 7,500 horses and 224,648 miles of single track. The directors saw that with the ordinary increase in traffic, etc., it would be impossible to operate the consolidated roads with horses in years to come. That they were right is shown by the fact that with the present business if horse power were used exclusively it would take 18,000 horses. With a knowledge of Boston's streets it will at once be seen that were horses used today the present business could not possibly be handled.

Careful investigation was made of the cable system. The difficulties of using that system in Boston were very serious, owing to the crookedness of the streets and the large number of draw-bridges; and when petitioned for the right to use it, the several city governments were very reluctant to consent. While this question was under general discussion, it was reported that the overhead electric system had been proved a success in Richmond, Va.; and on investigation the report was so far substantiated that the West End Company determined to try that system on its new line on Beacon street. It was a street admirably adapted for the purpose. Considerable opposition to the granting of the right to use overhead wires was made, but was finally overcome by an agreement to use the underground system on the Back Bay. The conduit proved a failure; but the overhead system gave so much satisfaction that a general right to use it in Boston was granted in 1889.

#### OFFICERS.

Colonel William Alexander Gaston, the president, is a son of ex-Governor William Gaston and Louise (Beecher) Gaston, and was born in Roxbury, Mass., May 1, 1857. His early education was obtained in private schools and in the Roxbury Latin School. He graduated from Harvard in the class of 1880, and subsequently from the Harvard Law School. After admission to the bar he began practice with his father and Charles L. B. Whitney, entering into partnership with them October 1, 1883. His present partner is Frederic E. Snow, under the firm name of Gaston & Snow, and they have a very large practice. He is regarded as one of the ablest members of the Suffolk bar and has given much attention to corporation law.

Mr. Gaston is a director of the Manufacturer's National Bank and a trustee of the Proprietors of the Forest Hills Cemetery; he is a member of a number of clubs—the Somerset, the Puritan and the Athletic Club of Boston, the Country Club of Brookline, the Commodore Club of Maine, and other associations. He was a member of the staff of ex-Gov. William E. Russell. When the Boston Elevated Railway Company was organized he was elected its president, which position he now holds, and the successful organization of the company is conceded to be due to him more than any other man.

General William Amos Bancroft, the vice-president, was born April 26, 1855, in Groton, Mass., and is the son of Charles and Lydia Emeline (Spaulding) Bancroft. He comes from the old colonial stock, the Bancroft and the Spaulding families both being descended from English immigrants who landed in Massachusetts about 1640. In farm work and in country sports young Bancroft laid the foundation of a vigorous constitution. He attended the public schools and the Lawrence Academy in his native town, and afterwards Phillips Exeter Academy, New Hampshire, from which he graduated in 1874. He matriculated at Harvard College in 1878, and graduated from the Law School. He was admitted to the Suffolk bar in 1881. When in college he became noted for his athletic prowess, and was captain and stroke oarsman in the victorious Harvard University crews of 1877, 1878 and 1879, the victories being largely due to his energetic management. Later, for about five years, he was the "coach" of various Harvard crews. When a college freshman





GEN. W. A. BANCROFT,  
First Vice-President.



J. H. GOODSPEED,  
Comptroller.



CHARLES S. SERGEANT,  
Second Vice-President.



HENRY F. WOODS,  
Purchasing Agent.



H. L. WILSON,  
Auditor.



JOHN T. BURNETT,  
Secretary.



ROGER W. CONANT,  
Electrical Engineer.



JULIUS E. RUGG,  
Superintendent of Transportation.



CHARLES F. BAKER,  
Superintendent of M. P. & M.

he enlisted as a private in the Cambridge Company of the Fifth Regiment of the State Militia, and after being promoted through the several grades became company commander in 1879, and commanding officer of the regiment in 1882. For several years he was the senior colonel in the militia and was made brigadier general and commander of the Second Brigade in July, 1897. Under his command company, regiment and brigade have reached a high standard of efficiency. In 1889 the Fifth Regiment was detailed, on account of its high standing, as escort to the state delegation on the centennial anniversary of Washington's inauguration in New York.

Thirteen years ago General Bancroft started in the street railway business as superintendent of the Cambridge Railroad. It was a horse railway and was in competition with the Charles River Street Railway. About 15 months later he became superintendent of the two companies which were united under the name of the Cambridge Railroad. During this time he had good success in the operation of the two companies and a number of changes were made for the advantage of the public, of the companies and of the employes.

In the winter of 1887 occurred a strike of about 600 employes who went out between lights leaving the company with 1,800 horses on its hands, and six men, a woman and a boy in the stable to look after the horses, and a few repair shop hands

at which ex-Governor Greenhalge was first nominated. In 1891, he was elected president of the New England Alumni of Phillips Exeter Academy. He was also president of the Mayor's Club of Massachusetts, the Cambridge Club and the First Volunteers Citizens Association, of Cambridge.

John T. Burnett, secretary of the company, was born in Southboro, Worcester county, Mass., April 23, 1868, and is a son of the late Joseph Burnett, of Southboro. He was educated at St. Mark's School, Southboro, and was a member of the class of 1891, Harvard University. He was a member of the Dickey and Basty Pudding Clubs, played on the freshman football team that beat Yale, and was manager of the University baseball nine of 1890. For three years he was with the Old Colony Trust Company after leaving college, was appointed assistant postmaster of Boston July 1, 1893, and acting postmaster upon the death of the postmaster, Colonel Coveney. He was elected secretary of the Boston Elevated Railway Company in January, 1897.

William Hooper, treasurer of the company, was born in Boston in 1855. He graduated from Harvard in the class of 1880. For three years he was associated with the Amoskeag Manufacturing Company, leaving it to go with the Pacific Mills. He was treasurer of the Fiskdale Mills, treasurer of the Atlantic Cotton Mills and auditor of the Calumet & Hecla Mining Company. He assumed his present position January, 1898, which is the



PRENTISS CUMMINGS,  
Advisory Counsel.



A. L. PLIMPTON,  
Civil Engineer.



D. L. PRENDERGAST,  
Bureau of Real Estate.



G. A. KIMBALL,  
Bureau Elevated Lines.

besides. He kept the cars running except for three days. The cars commenced running on a Saturday, stopped running the following day, Sunday, commenced running again Monday morning and have been running ever since. The men with whom he dealt at the time, those who went out on the strike, afterwards talked with him personally and all save a very few admitted that they had made a mistake in striking.

After the West End Street Railway Company absorbed all the street railways General Bancroft was appointed roadmaster of the entire system, superintending the first construction of the electric lines of the West End Company. As a street railway superintendent his administration was eminently successful, and energy, firmness and tact, together with his manner of handling the great strike in 1887 brought him into prominent notice. In 1890 he left the street railway service with the good will of its employes and returned to the practice of law. In the fall of 1881 he was elected a common councilman and the following year was elected a representative to the legislature and was re-elected in 1883, and again in 1884. In the fall of 1890 he was elected an alderman of Cambridge and the following year re-elected. He served as president of the Board and chairman of the Finance Committee during both years. Elected mayor in 1892, he served for four successive years as chief executive. In 1893, while mayor, he was made an overseer of Harvard University and in the same year presided over the Republican State Convention

only official position he now holds in any company. From November, 1893, to January, 1898, Mr. Hooper was a director and member of the executive committee of the West End Street Railway Company.

Charles Spencer Sergeant, second vice-president, was born in Northampton, Mass., in 1852, the son of George and Lydia (Clark) Sergeant. His father was born in Stockbridge, Mass., which has been the family home since the settlement there in 1735 of his great-great-grandfather as a missionary to the Stockbridge Indians.

He was educated in the public schools of Northampton and graduated from the high school in 1868; in that year began his business career in the employment of the First National Bank of Easthampton. In 1872 he entered the steam railroad business as paymaster and cashier of the Marquette, Houghton & Ontonagon Railroad Company, and was also associated with various iron companies and engaged in the iron smelting business.

In 1876 he came to Boston to take the position of chief clerk of the Eastern Railroad Company, subsequently being appointed general auditor. In December, 1887, when the West End Street Railway Company came into possession of the several street railways centering in Boston, he was offered and accepted the position of general auditor of the company, subsequently being made second vice-president, and in November, 1892, being ap-





H. P. QUICK,  
Chief Mech. Draftsman.



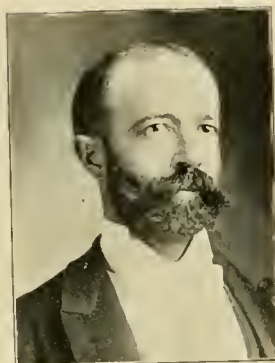
LOUIS F. HYDE,  
Claim Department.



C. S. BAXTER,  
Claim Department.



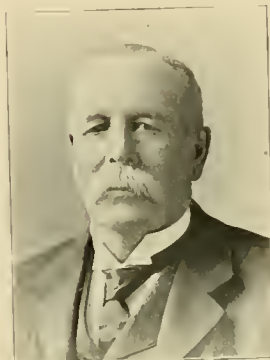
THOMAS W. BEVAN,  
Supt. of Power Stations.



J. H. HILDRETH,  
Supervisor of Time Tables.



H. L. LIBBY,  
Supt. Car Shops.



RICHARD HAPGOOD,  
Supt. of Tracks.



JOHN L. MITCHELL,  
Supt. of Mach. Shops.



CHAS. H. HILE,  
Supt. of Wires.



C. E. LEARNED,  
Supt. of Inspection.



FRANK T. LEWIS,  
General Storekeeper.



RICHARD T. LAFFIN,  
Supt. of Employment.

pointed general manager, which position he held until the lease to the Boston Elevated Railway Company.

Julius Erastus Rugg, superintendent of transportation, comes of sterling old New Hampshire stock, being the son of Capt. William S. Rugg, of Rindge, N. H. At eighteen years of age he became a country school teacher, like many other New Hampshire men who have risen to positions of trust. Coming to Boston four years later, he became a conductor on the Chelsea and Boston cars, and after a year's faithful service, was put in as receiver in the street railroad office in Chelsea square, where he remained for three years, leaving the position to become super-

intendent of the Lynn & Boston Railroad. After four years with this corporation, he left to become superintendent of the Highland Street Railway Company in Roxbury, where he remained for 14 years in charge of what was known at that time as the most progressive street railway in the country. Upon the organization of the Boston Consolidated Street Railway he became its general superintendent, holding the position two years. Mr. Rugg then went to Minneapolis as general manager of the Minneapolis Street Railway Company, but after a year in the west, he received a call, as the ministers say, to become general manager of the Citizens Traction Cable & Electric Company, of



H. M. BALLARD,  
Supt. Car Equipment Shops.



JOSEPH W. MOORE,  
Supt. Div. 1.



JOSEPH M. GOULD,  
Supt. Div. 2.



E. J. MCCLENCH,  
Supt. Div. 4.



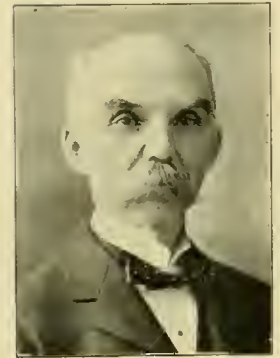
WILLIAM S. COLLINS,  
Inspector of Motor Car Repairs.



JOHN H. STUDLEY,  
Supt. Div. 6.



JOSEPH DEE,  
Supt. Div. 7.



CHARLES W. HAWES,  
Supt. Div. 8.

Pittsburg. After serving that corporation with credit for seven years, he returned to the scene of his first successes, and became general superintendent of the West End Street Railway Company. After two years, the lease of the West End Company to the Boston Elevated Railway put him in his present position.

Probably the quality which has led to such advancement in Mr. Rugg's career has been his progressiveness. Always striving to be not only up to date, but looking ahead, and keeping in touch with all improvements in street railway work and methods, he has introduced many valuable improvements in the street railways with which he has been connected. He introduced snow scrapers on cars and double-end snow plows while superintendent of the Lynn & Boston Railroad. In the Highland Street Railway superintendency he introduced roller boxes on cars, cross-seat open cars, improved high-wheel snow plows, cased windows in box cars in cold weather and other devices for the comfort of passengers and to attract traffic. He was the first to put uniforms on conductors and drivers, in 1872, and first made use of a cash register in Boston, in 1876. Under his charge the Citizens Traction Company was made a model cable road in its organization and operation. Believing in co-operation with employes, he organized the first Relief Association for street railway employes in Boston on the old Highland Street Railway, and also organized an association of the same kind in Pittsburg. Respected and liked by his superiors and by the men in his charge, he has become widely known as a successful and able street railway man.

Charles F. Baker, superintendent of motive power and machinery, was born in Shoreham, Vt., in January, 1855. The family moved to Wisconsin when he was small, and young Baker secured a position in Milwaukee, where he learned the trade of an engineer. He has since had a varied experience as a mechanic

and engineer, and has held many important positions. He is well known among the street railway companies of the country, and to manufacturing corporations as well.

In the year 1893 he came into the employ of the West End Street Railway Company of Boston, serving as master mechanic. Under his direction and supervision four of the power stations of that company, those at Dorchester, East Boston, Charlestown and Harvard street, were built and equipped. The extension of the company's lines demanded the entire remodelling and enlargement of the Central power station of the West End Street Railway Company, and some notable improvements, among which is an improved system of handling coal in the station, were introduced under his direction. When the Boston Elevated Railway Company secured its lease of the property of the West End Street Railway Company, Mr. Baker went with the new corporation to take his present position.

Henry F. Woods, who is the head of the bureau of purchase of the Boston Elevated Railway, was born in Hillsboro, N. H., February 22, 1832. At the age of 18 he went to Boston and engaged as clerk in a grain store; later he was associated with Hicks & Hathaway, flour, grain and provision commission merchants. In 1869, a new firm, Hathaway & Woods was formed, and continued till 1887.

Mr Woods has held various offices in the town and city of Somerville, as well as in the Boston Board of Trade and the Commercial Exchange, being president of the latter when it was united with the Produce Exchange under the name of the Boston Chamber of Commerce, of which he is still a member. He was one of the originators and directors of the Charles River Street Railway, later united with the Cambridge Horse Railway; he continued as a director till the road was absorbed by the West End Company.



Mr. Woods was purchasing agent of the West End Street Railway Company for 10 years and holds the same position with the Boston Elevated.

H. L. Wilson, auditor of the Boston Elevated Railway Company and president of the Street Railway Accountants' Association, was born in Boston in 1862 and received his education in the public schools of that city. From the time he was 16 years old until 1887 he was connected with several mercantile and importing houses. His progress in the business world was not such as to satisfy the young man, so he concluded to seek his fortune in the west. Accordingly he went to Kansas City and joined the auditor's force in the office of the Metropolitan Street Railway Company, where he obtained his first experience in railway accounting. In 1888 Mr. Wilson was offered and accepted the position of head of one of the departments in the auditor's office of the West End Street Railway Company, of Boston, and in 1891 he was elected auditor which position he held until the lease to the Boston Elevated when he became auditor of this company.

### ROLLINO STOCK.

The Boston Elevated Railway Company operates about 1,200 closed cars and 1,200 open cars; these cars are from the shops of several makers, among them the Barney & Smith Car Company, the J. G. Brill Company, the Brownell Car Company, J. M. Jones' Sons and the Stephenson Company. Twenty-five-foot bodies are now the standard in closed and nine benches on open cars; the former seat 34 passengers, and the latter five on a bench. All platforms on box cars are open, no vestibules being used, but the platforms are each guarded by two gates; open



GIRDER RAIL SECTIONS, 1897.

cars have no guards. Fenders are all of one type and attached to the car, the so-called "Cleveland" pattern being adopted.

Series-parallel controllers and double motor equipments are used on all 20-ft. and 25-ft. box cars in winter and on 10-bench and 25-ft. cars only in summer. Others use the rheostat control and single motor equipment in summer; these include the 20-ft. box and 7 and 8-bench open cars. All cars have electric lights, headlights of the company's own design and make. Electric heaters are by law required in all closed cars, and these have been largely furnished by the Consolidated Car-Heating Company, of Albany. Fare registers are mostly of the "Security" type, made by the St. Louis Register Company. Electric bells are used for signalling the conductor on both types of cars. The cars are mounted on trucks of various makers; among them are the Baker, Barney & Smith, Bemis, Brill, Peckham, Taylor and West End trucks. The E. T. Burrowes Company's curtains are used on over 400 of the Boston cars. E. F. De Witt & Co. have equipped many of the West End cars with their sand boxes.

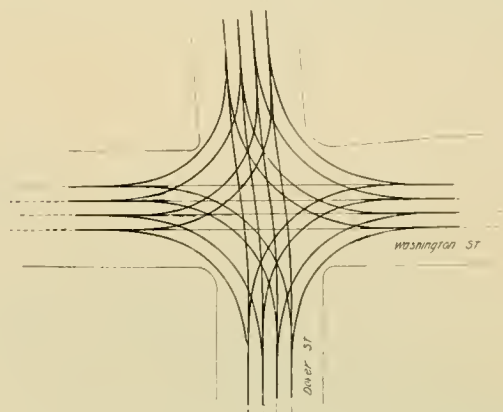
Westinghouse No. 12 and No. 12A, and Walker motors are largely used.

A large number of snow plows are required and kept in the various car houses; of these there are 13 Taunton double track share plows. There are no electric sweepers. The company has a large equipment of special cars, such as mail, parlor, freight, motor and coal cars.

Minor car and truck repairs are made in the car house pit rooms, but in case of heavy damage cars are sent to the car shops. Here also all cars are repainted once a year, and old cars are rebuilt. At the equipment shops on Albany street new cars

are equipped with trucks and electric apparatus, and all old cars refitted. The care and repair of signs, glass, doors, cushions, etc., for 2,400 cars keep a large force of men at work constantly. Armature repairs are made in the company's shops on Albany street.

Cars and trucks in ordinary use are cleaned at the car house, wash and pit rooms. Each car is inspected every day. All motors are opened or dropped once a month and at such times trucks



SPECIAL WORK AT DOVER AND WASHINGTON STREETS.

are overhauled. So far as possible trucks and motors of each type are concentrated at certain houses to lessen the variety of spare parts carried and facilitate repairs.

On account of the narrow streets the width of the cars is limited to 8 ft. Truck centers on long cars are 14 ft. apart. Swivel trucks of 39-in., 48-in. and 62-in. wheel bases are used; short trucks have wheel bases of 6 ft. 6 in.

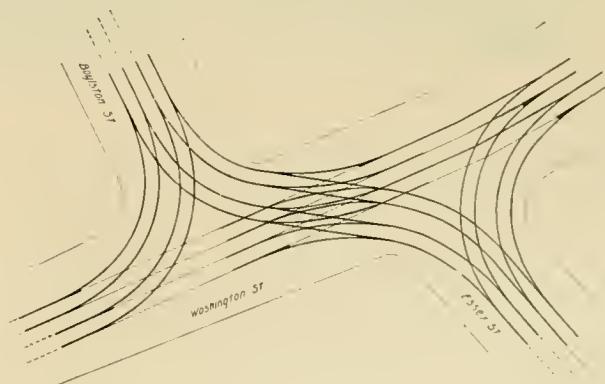
The long cars seem to be preferred in Boston to any other style. They take up less room per passenger, in the street, require no greater operating force and are more roomy and healthful and ride easier than the shorter cars.

### TRACK.

In track construction a 9-in. girder rail is used laid on a tie plate 1 in. thick with 2x1 1/2-in. tie-rods 5 ft. apart. The paving blocks used are 12 in. long, 4 in. thick and 8 in. in depth, and are laid either on gravel or a concrete base.

September 30, 1897, the company had 25,000 ft. of electrically welded rail in service.

All special work and guard rail is cleaned twice a day and in freezing and snowy weather this work is kept up continually. Except on the most important streets, nearly all track repairs



SPECIAL WORK AT BOYLSTON, WASHINGTON AND ESSEX STREETS.

are made during the day time. When special work is put in, the work has almost always to be done at night so as to delay traffic as little as possible. In many cases when laying new rails work is done both day and night.

The weight of the rail used is the same throughout the city, about 95 lbs. per yard, furnished in 1894 by the Johnson Company, and in 1898 by Wm. Wharton, Jr. & Co. Where the track runs through park reservations and not on the highway, a 7-in. T rail is used. This is set on a 1-in. tie plate so as to give 8-in. depth of lean for a width of 25 ft. which the company maintains. The best known type of special work, 10-in. construction, that can be found on the market is used by the company. This work was nearly all built by the Johnson Company and Wm. Wharton, Jr. & Co.

In snow cleaning, sleds are used to carry off snow plowed in the congested parts of the city while in the suburbs levellers are

Eagle street, near Chelsea creek, East Boston; the "Charlestown" on Hamblen street, near the Mystic river and Malden Bridge, Charlestown; the "Dorchester" on Freeport street and Dorchester Bay, Dorchester; and the "Harvard" on Boylston street, Cambridge, near the Charles river.

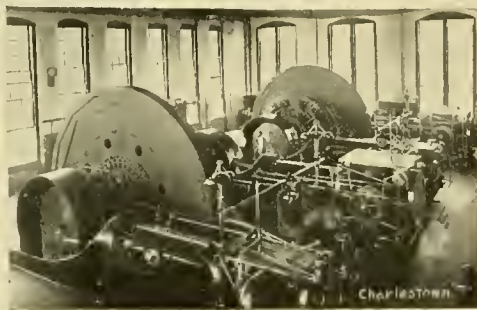
These stations supply current to lines as follows:

Allston: Brighton, part of Brookline and into Newton.

Central: The city proper, South Boston and parts of Brookline, Roxbury and Jamaica Plain.

East Cambridge: Parts of Cambridge, Charlestown, Somerville, Medford, and at times, part of the city proper.

East Boston: East Boston and Chelsea.



used. The track cleaners used are those made by the Van Dorn & Dutton Company.

### POWER STATIONS.

The Boston Elevated Railway Company operates seven power stations in the Metropolitan district, the lines being with three exceptions within a radius of six miles from the City Hall. It is about 13 miles by the company's lines from the end of one of the north-westerly to the end of one of the south-easterly lines fed by these stations. The extreme distance apart of these stations is about six miles.

The names and location are the "Allston" on Braintree street, Allston, near Cambridge street and the Boston & Albany Railroad; the "Central" on Albany street, near the South Bay and Waltham street, Boston; the "East Cambridge" on North street, and near Millers river, East Cambridge; the "East Boston" on

Charlestown: Parts of Charlestown, Medford, Somerville, Malden and Everett.

Dorchester: Dorchester and part of Roxbury.

Harvard: Cambridge, Watertown, Arlington and into Newton, Brighton and Brookline.

The aggregate nominal capacity of the present engine equipment of all stations is about 30,950 h. p. Some of the stations are large enough for additional units in both engine and boilers and others are equipped to their full capacity.

There is quite a variety of engines of different makes. Boilers in all but two stations are of the Babcock & Wilcox make. All stations but one are located on tide water.

The following is a detailed description of each station in the order of its erection:

The Allston power station was designed and built in 1888-9, and stands today as originally equipped except that one genera-



tor has been added to each of the four engines and the coal handling facilities have been improved.

There are now four Armington & Sims high speed, simple, non-condensing engines of 200 h. p., each belted to two bipolar 75-k. w. and one bi-polar 62-k. w. generator. Six boilers of 150 h. p. with the necessary feed water heaters, feed pumps, steam and exhaust piping, complete the mechanical equipment.

Coal is brought by the company's electric coal cars carrying eight 1¼-ton automatic, self-dumping boxes, which upon arrival are either dumped into the coal shed or taken into the boiler room and there dumped in front of the furnaces; in either case this is done by transferring the boxes with a swinging crane

This station is used only in the winter season to help out during the period of excessive loads, which always taxes the capacity of the stations in this region. This is due to the use of heavier cars in winter with a larger motor equipment than that used in summer to carry the same number of passengers, also to the use of electric heaters and snow plows.

The Central power station was designed and built in 1889-90-91 under the direction of F. S. Pearson, chief engineer, and William G. Preston, architect. The chimney, foundations for machinery and all the interior equipment up to 1895 were planned and built under the direction of F. S. Pearson, L. J. Hirt, assistant engineer, and H. P. Quick, chief draughtsman. As originally de-



to an overhead trolley track running through the shed and boiler room. Coal is hauled from the Central power station wharf several times daily. This station is shut down completely during a large portion of the year and its load taken by the Central and Harvard stations.

In 1889 a small station was installed at the Hinkley Locomotive Works on Harrison avenue to furnish power while the larger and main Central station was building. Five McIntosh & Seymour 200-h. p. tandem compound engines were installed with two 62-k. w. generators each, and boiler capacity to correspond. Later the boilers were removed when the main station boilers were erected, larger fly-wheels were put on the engines and two more generators belted to the same wheels. Still later five more McIntosh & Seymour engines which had also been used as temporary equipment in the main boiler house were reinstalled here with four generators each. In this shape the station now stands, having a total capacity of 10 engines and 40 generators or about 2,000 h. p.

signed there were to be six triple-expansion engines belted through counter shafting to 18 multi-polar 500-k. w. generators. These were eventually put in, but while waiting for them to be designed, tested and perfected, there being nothing of the kind in existence, there was installed a temporary equipment of 48 multi-polar 80-k. w. machines, the largest then on the market. When the station was completed as originally designed, there was wonderful elasticity and provision for emergencies in the arrangement, but its complications and waste of power, brought out so prominently by the development of the multi-polar direct connected generator, led to a change in 1895 and 1896. Under the direction of C. F. Baker, master mechanic, the six triple-expansion engines were enlarged and attached to generators of suitable capacity. The shafting, belt tighteners and old generators were removed and cross-compound engines of large power installed in their place, largely increasing the capacity of the station without adding to the structure. The boiler plant, however, was enlarged, the pumps and piping systems re-organized

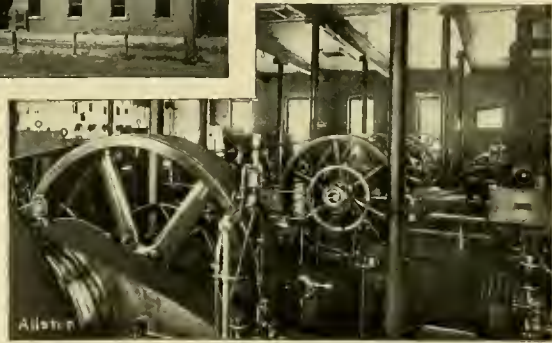
and simplified, so that the station as it stands is thoroughly modern and as economical to operate as any of the later stations.

The station has an ultimate nominal capacity of perhaps 20,000 h. p., although at present, machinery of only about 13,000 h. p. is installed in the engine room. There are six Reynolds-Corliss 1,600-h. p. triple-expansion, horizontal, condensing engines, making about 80 r. p. m. The cylinders are 23, 36 and 52x48-in. stroke. The fly-wheel is 24 ft. in diameter. There are independent air and circulating pumps of the Reynolds-Corliss vertical pattern, all working under 180 lbs. initial pressure, and surface condensers. There are two Reynolds-Corliss 2,000-h. p. cross-compound, horizontal, condensing engines with cylinders 32

pumps and boilers in the order named. All water of condensation except that from the condensers is returned to the boilers.

Two oil pumps for filling the gravity tanks, an air compressor, blower, motors and shafting for the pumps and economizers complete the outfit of the engine room. A feature worthy of note is that one motor with countershaft furnishes power for the six geared pumps, the blower, air compressor and two sets of economizer tube scrapers cleaning 2,080 tubes.

All the electrical controlling apparatus is grouped at the front end of the station on a gallery commanding a view of the whole engine room. Both underground and overhead feeders lead from the feeder gallery where are 15 vertical panels and 15 table



and 62x60-in. stroke with 24-ft. fly-wheels making 75 r. p. m.; also independent circulating pump and jet condenser of the vertical pattern. The latter two engines have feed water heaters, Stratton separators, built by the Goubert Manufacturing Company, and independent steam connections to each side so that either side can be operated under high pressure with the other disconnected.

All engines have practically indestructible plate fly-wheels weighing 60 to 70 tons. All have intermediate re-heating receivers, free exhaust, and circulating condensing water connections. The latter is taken from South Bay by 36-in. cast iron pipes having the necessary fish traps, check valves and screens, and connections are made direct with all condensers.

The feed water is handled by a series of six electrically-operated gang pumps of the four-plunger pattern, piped to heaters, economizers and boilers and connected with city water pipes by the usual methods. Water goes through the heaters, economizers,

panels, the latter of the Westinghouse pattern. In a separate building near the station is a complete set of testing apparatus for underground cables.

Next to the engine room and on either side are Green economizers, one set for each bank of boilers. Over them are the oil tanks, filters, etc.

The boiler house contains 24 Babcock & Wilcox 250-h. p. boilers connected in pairs and six Babcock & Wilcox 500-h. p. double decked boilers, similarly coupled. They are connected by iron flues and uptakes with the economizers and chimney.

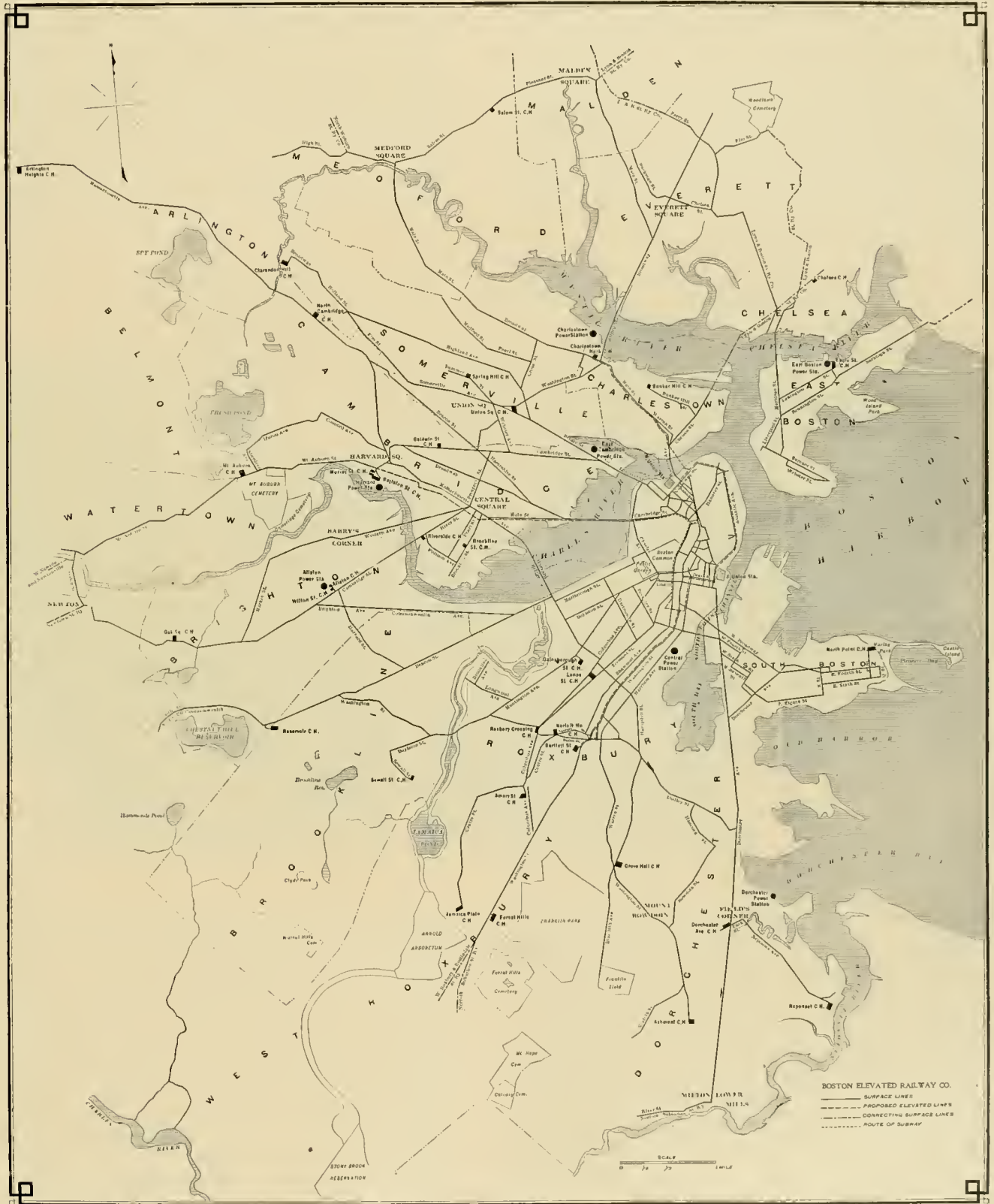
The coal handling facilities at this point are unique and economical. Stokers are not used. Coal is delivered at the wharf on Albany street by schooners and barges and is hauled from the wharf into the boiler room by an electric mining locomotive with two automatic Hunt side dumping cars attached. The haulage is about 950 ft. at the farthest on a narrow gage track.

Coal is taken from tunnels under the coal pile on the wharf



and after crossing Albany street, at grade, the cars cross the scale platform at the gate house where all the coal is weighed. Then the train rises on a gentle grade to the boiler house, passing down through the center on a trestle  $2\frac{1}{2}$  ft. high, and delivers

On the wharf the methods of handling coal are no less interesting. A traveling bridge crane with a span of 150 ft. between tracks, does all the handling of coal between the vessel and the cars. In the cab at the water end of the crane is a motor with



coal at any point required, no trimming being done at all. Ashes are taken out by the same cars and dumped on either side of a spur track. From here, at a profit to the company, they are carted away for filling.

friction drums, gearing, etc., which controls all the movements of the bucket, dropping it into the barge, picking up the coal and dumping it at any point under the crane, generally over the tunnels through which the coal passes by chutes to the cars.

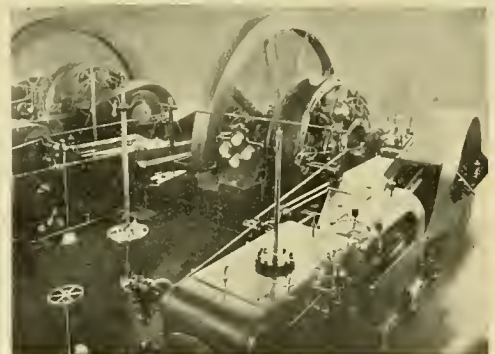
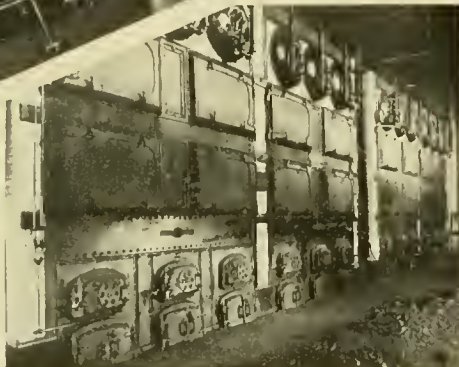
Coal can also be picked up on the wharf and transferred to any part of it by the same mechanism. The lateral movement of the bridge crane is for convenience in unloading from any part of a vessel and is controlled by a separate motor. From the wharf also coal is hauled by cars to different car houses in the system and to the Allston and Harvard power stations.

The smoke stack at this station is the largest and highest in the vicinity of Boston, being 252 ft. from the yard to the top and 13 ft. 8 in. inside diameter of flue. It is well protected by lightning rods and there are no facilities for reaching the top.

The East Cambridge power station was designed and erected at the same time as the Central station, under the direction of Mr. Pearson, and although originally there were installed 20 multi-polar 80-k. w. generators belted to the engines, there are now 7 multi-polar 500-k. w. belted in the same manner to two 1,400-h. p. and one 600-h. p. Reynolds-Corliss triple-expansion en-

giner. It was designed by F. P. Sheldon, mill engineer, of Providence, R. I., and has a nominal capacity of about 750 h. p. The equipment consists of three 250-h. p. tandem, compound, horizontal engines direct connected to three 200-k. w. generators. This is the first direct connected plant installed by the company. There are four vertical 250-h. p. boilers with flues direct to an iron stack. There are no economizers. Two Deane circulating pumps and independent jet condensers, a feed-water heater and two steam feed pumps form the principal auxiliary apparatus. Water is taken from the river for condensing purposes. Coal is delivered by teams from neighboring yards and handled in the usual manner for such small plants. Feeder and machine panels with the usual devices for measuring the current are installed here as in all the stations of the company.

The Charlestown power station was designed under the supervision of C. F. Baker, master mechanic, and H. P. Quick, chief



gines. The former has cylinders 23, 36 and 52x48-in. stroke with 28x10-ft. 7-in. fly-wheels double belted to counter-shafting and this in turn to three of the generators. The smaller engine has cylinders 16, 25 and 36x48-in. stroke with 26-ft. fly-wheel belted to one generator. Although built for 500-k. w., these generators are now rated at 240-k.w. only. Massive belt tightening machinery is used and two cranes cover the whole station.

The boiler plant consists of 10 Babcock & Wilcox 250-h. p. boilers coupled in pairs and connected by iron flues with two Green economizers. Nearly all the piping in the station is in duplicate. There are independent air and circulating pumps, surface condensers, steam and power feed pumps, inspirators and an extensive oiling system, feeding the machinery by gravity. The power pumps, machine shop shafting and economizer scrapers are operated by a 62-k. w. motor. Condensing water is taken from the river near by through 30-in. pipes with check valves, traps, etc. The chimney is 225 ft. high and has about 5,000 h. p. capacity. Coal is handled by the ordinary methods, no special machinery being installed.

The East Boston power station is a small brick station completely isolated from all the other stations of the company so

draughtsman. Built in 1895, it was laid out for an ultimate capacity of about 6,000 h. p., the chimney, a 10x200-ft circular brick structure, being of this capacity. The station as built contains only two units, each of 1,000 h. p. nominal rating. They are Reynolds-Corliss cross-compound, horizontal, condensing engines with cylinders 26 and 50x48-in. stroke, making 90 r. p. m. and direct connected to 800-k. w. generators. They are equipped with the Reynolds vertical air pumps and condensers, Stratton separators, feed water heaters, Schutte's automatic exhaust valves and have besides, re-heating receivers, separate steam connections to both high and low pressure cylinders with starting, reducing and automatic stop valves. There are salt water connections with the Mystic river, the pipes having combined check and stop valves and fish traps at each condenser. At the river end of the intake pipe, the bell mouth is enclosed in a timber box with wire screens, all held firmly in place by piles at each corner. The bottom of the intake is below mean low water and as the tides at this port have an average variation of about 10 ft. it means quite a high lift for the injection water. In the boiler room are installed three 500-h. p. Babcock & Wilcox boilers and a Green economizer. The boiler feed water is handled by a steam pump



and inspirators. The station has a complete oil system comprising pump, storage, filter and service tanks. Coal is discharged at the end of the pier several hundred feet out in the river, being hoisted by steam, in tubs, and discharged direct into Hunt automatic side-dumping cars which run by gravity to the station yard and dumps, returning by the action of a counter weight. From the coal pile, it is wheeled in, weighed and discharged in front of the furnaces.

The station is of brick with Guastavino tile arched roof and has a 7-ton traveling crane. The machine and feeder panels are on the main floor in front of the engines. The fly-wheels have "indestructible" rims of wrought iron plates with cast iron spokes and centers.

The Dorchester power station was designed by C. F. Baker and H. P. Quick, and built in 1896 on the shores of Dorchester Bay. The station is of brick and may be called the company's standard design. The boiler and engine rooms are under separate roofs, although the two rooms adjoin, being separated only by a brick partition. The roofs are of the Guastavino type, made of fire proof tile arches of large span, from 2 in. to 4 in. thick

Coal is delivered by vessels at the end of a long pier and is discharged by the buckets first into a push cart which in turn dumps into a Hunt automatic side-dumping car on a lower level. This runs by gravity to the boiler house and there dumps, where it is wheeled in by hand. The electrical instruments are located with the office on a gallery giving a clear view of the engine room. Below are the toilet, locker and test rooms, all built of steel and fire proof construction.

The Harvard power station was designed by the company's engineers and built in 1897. This station although similar in general design and equipment to the Dorchester and Charlestown stations embodies some novel features and requirements made necessary partly by its location on one of the principal streets and parkways of the city of Cambridge, and partly by its distance from the sea. It is built for an ultimate capacity of 7,200 k. w. Space is provided in the present structure for four of the six 1,200-k. w. units, but only three are installed at present. The engines are of the Reynolds-Corliss make, cross compound, condensing, of 1,800 h. p. capacity, having cylinders 28 and 56x60-in. and running 60 r. p. m.



covered with asphalt and paper and supported by light steel trusses. The chimney is of brick, circular in section with 10 ft. flue and a height of 200 ft., surmounted by a cast iron cap and well protected with lightning rods.

The equipment of the station consists of two cross-compound, horizontal condensing engines of 1,500 h. p. each, direct connected to 1,000-k. w. generators. The station has a capacity of three units in both engines and boiler room. The engines are 26 and 50x60-in. and have fly-wheels of special indestructible design. Condensers, feed-water heaters and Stratton separators are used. Independent steam and exhaust connections are supplied to each cylinder so that either side can be used separately. Salt water is taken from the bay in a manner similar to the Charlestown station. A novel feature is the return of the salt condensing water through an open channel under the furnace ash pits carrying the ashes out of the station and depositing them within the timber bulkhead enclosure for filling.

In the boiler room, there are four Babcock & Wilcox 500-h. p. boilers connected by a brick flue to a Green economizer with bypass underneath and thence to the chimney through a connecting flue of brick. Three sets of dampers are provided, those in the chimney being connected with the damper regulator.

Feed water is handled with a power pump belted to a counter shaft and this in turn to a 15-h. p. motor. The economizer scraper mechanism is operated by a separate motor of the railway type.

Vertical condensers of the jet type are used and all the other auxiliary apparatus is similar to the Dorchester power station except that gang feed pumps of different make are used, operated by the same motor that runs the economizer scrapers. The boilers are six in number of the Babcock & Wilcox 500-h. p. double-deck type with extension furnaces and combustion chambers, a requirement adopted in view of the well known objection to the smoke nuisance in residence districts. Green economizers are used and so placed that they will be exactly in the center of the boiler plant when the ultimate capacity is installed.

City water is used in the boilers here as well as in all stations. Condensing water is taken from the river and discharged there also. The two pipes are arranged with cross connections and valves so placed in a gate house that below these valves they are interchangeable as intake and outlet. The scouring action of the overflow from both of these pipes enables the company to dispense with the usual crib and screens at the pier line, no structure being allowed in the river at this point. The coal handling facilities here have been designed to meet especial conditions not previously met. Although coal could be brought up the river, it was found cheaper to haul it by electric car from the Central power station dock. Objections to the unsightliness of a coal pile also determined the method of storing the coal so brought. Consequently an elevated inclined track spiral in form was built, starting at the street and ending over a timber coal pocket. Into this, coal is dumped from the hopper cars. From

the pocket it runs by chutes into Hunt cars which are pushed by hand into the boiler house, weighed, and then placed in front of any boiler. Ashes are removed by the same cars and used for filling around the coal pocket.

The electrical installation is on a gallery at one end of the station. It is noticeable that no wires are visible leading from the station, they being underground, a precaution against fire which removes an unsightly object from the street. Underground conduits carry the Cambridge feeders for a long distance from the station, but the feeders which connect this station with Allston are overhead.

A description of the stations such as the foregoing would not be complete without a few words on the general method of tying the stations together. All the stations except the East Boston have inter-station feeder connections. Switches are so placed and feeders so arranged that lines in certain districts can be operated by any one of the nearest stations, or those stations can be connected up in multiple with the lines and they are frequently run in this manner.

Trolley wires are divided up into a large number of sections insulated from each other, each controlled by switches in pole boxes, near by, so that in case of trouble on any section, the others may be operated. Of course, in case of fire, feeders might have to be cut rendering it difficult if not impossible to operate all other sections except that affected, but this has been well provided for in the construction of underground conduit for feeders through some of the closely built residential districts or fire hazardous districts where a large number of wires would be a menace. There are conduits from the Central station down town, from the Dorchester station intercepting some main lines, from the Harvard station to Harvard square and vicinity, and from Craigie Bridge through some of the narrow streets of the West End.

In case of the inability of one station to hold the load on a feeder, the matter can often be arranged by ordering the same feeder switches in another station closed, the two together holding the load until the trouble is located or the load decreases. If some of the smaller stations were shut down, the load might be held for a short time by the surplus power of the larger stations, but if the reverse should happen it would be necessary to pull off cars or send gangs out to shut off certain sections of wire which might be the cause of trouble.

At night, as the load gets rapidly lighter, all stations except the Central are gradually shut down and the most distant lines are then fed through the several station bus bars by means of the inter-station connections to the same.

The operation of all stations, the shifting of loads, and the troubles of all kinds interfering with the fixed running order of the stations are in charge of the superintendent of power stations.

#### CAR HOUSES.

The company has 37 electric car houses built for the most part on the same general lines so far as conditions allow. Variations in the size of lots, in the position of streets and track approaches, in the city or town requirements where situated always affect the design more or less. The car houses are located in Boston, Brookline, Cambridge, Arlington, Somerville, Medford, Everett and Chelsea.

The buildings are arranged in nine divisions, each under the control of a superintendent who is responsible to a superintendent of transportation.

The structures are mostly of wood, or wood and brick combined, the rules being to have all inflammable material enclosed with brick walls, fire doors and shutters.

There are however nine all-brick buildings. The largest single structure is the Grove Hall car house which is 23 tracks wide and 10 cars deep with two transfer ways and two pit rooms, and a storage capacity of 192 25-ft. cars all on one floor. The North Point car house at South Boston has however with its two story house and several buildings and yard tracks in one group covering nearly three acres, a total storage capacity of 337 cars. Next in size is the Bartlett street group with 168 cars capacity including the company's paint shop of 58 cars capacity. On a 25-ft. car basis the Lenox street house holds 133 cars, the Salem

street (Medford), Armory street (Boston), and North Cambridge houses, 125 each; the Forest Hills, 120; Dorchester, 103; Oak square, 100; Park street, 97; Reservoir (Brookline), Charlestown Neck, Neponset and Jamaica Plain, each 92. There is one house holding between 70 and 80, six between 60 and 70, one between 50 and 60, three between 40 and 50, four between 30 and 40, six between 20 and 30, making a total capacity of 2,986, while contemplated additions will bring the total well over the 3,000 mark. In fact while this capacity for the most part is figured on a basis of all 25-ft. cars, there are about 1,500 shorter cars in use, so that the actual capacity with mixed cars is about 3,500.

Many of the car houses were built by the various street railway companies of which the present system is a consolidation, and these have been altered to suit the condition of electric traffic and would not in most cases be pointed out by the company as models of their kind. Some of the best and latest have been mentioned.

The basis on which the more modern houses are laid out is upon the following requirements. A large operating space in the front part with waiting room, lobbies, offices, etc. at one side, and a wash room for two cars on the other side or in the center. Between this and the pit room a transfer way; back of this way a pit room with shops at one side such as stock, blacksmith and boiler rooms; a building provided with fire partition walls, heavy plank floors throughout, cross monitors for light and ventilation and plenty of doors and windows for light and fire exits, and if possible entrance to all the tracks from the street so as to avoid transferring cars inside the house.

Each house is in general provided with a waiting room, offices for foreman and starter, separate lobbies for conductors and motormen, stock room, blacksmith shop, boiler room, oil house and space for sand, salt and coal. Each house is heated by steam, lighted by electricity, and has ample water supply, drainage and fire service systems. The latter usually consists of several lines of hose on both floors and roof, supplemented by pails of water and hand extinguishers. Five of the largest houses, Grove Hall, Park street, North Point, Charlestown Neck and Lenox street, are equipped with an elaborate dry pipe sprinkler system comprising, besides the sprinklers covering every square foot of area, a system of roof hydrants, a wooden storage tank of 40,000 gallons capacity heated by steam and a pump house equipped with a motor-driven rotary pump, automatic valves and all necessary connection to city service and tank.

In addition to the foregoing equipment there are installed in each house an electric flush transfer table, a boiler of 60 h. p., a forge and several cranes and hoists. Coal and stock are now handled by the company's cars. Each house is surmounted by a handsome clock and the company endeavors to make the buildings attractive and free from any nuisance as many of them are in the residential districts.

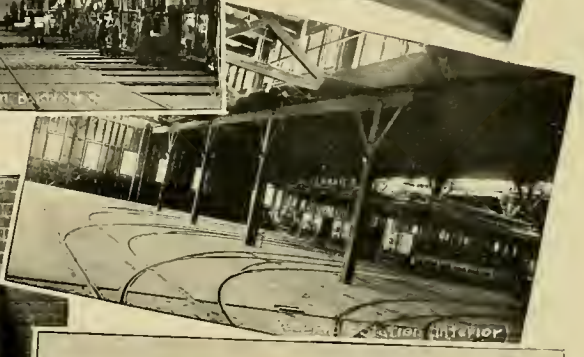
#### EMPLOYES.

In Massachusetts a state law limits the hours of labor of conductors and motormen to 10 hours of actual work, to be done within 12 hours. For a day's work the regular rate of payment is \$2.25 with an extra amount per hour for work done over time.

Violations of rules are punished by reprimand, suspension or discharge. All promotions are made according to seniority of service and fitness for the position. No prizes of any kind are offered.

The visiting manager cannot fail to be impressed with the high standard of discipline in force, and the excellent quality of the men selected to serve as conductors and motormen. And this favorable impression is not the result of any special admonition to be on good behavior during the few days the passengers with buttons are in the city and riding upon the cars. On the contrary what our readers will see is the regulation day in and day out performance of duty, and how this very desirable result has been achieved is perhaps best told in a circular letter issued by the company. Applications are so constant and numerous it was found necessary to have a general statement which would serve to answer all. Here it is:







The excellence of the conductors and motormen employed by the Boston Elevated Railway Company is frequently a subject of favorable comment by visitors to our city, but the public generally do not know what pains are taken by the company to secure suitable men.

In the first place, the wages paid are of the highest and the hours of the best, 10 in 12, established by law. In the next place, the time has gone by when even the president of the company or any of its directors undertake "to put a man to work," upon request.

Some years ago an Employment Department was established with a superintendent and clerk who give their entire time to hiring men. The process is of the most searching character. The requirements are that both conductors and motormen shall not be less than 21 or more than 45 years of age; that their eyesight and hearing should be perfect; that their height should be not less than 5 ft. 4 in., for conductors, and 5 ft. 6 in. for motormen; that they should not have lost any of their fingers or thumbs, and in the case of the conductors that they should possess a common school education and should furnish a bond with two real estate owners as sureties, each in the amount of \$300.

Motormen must be able to read and write the English language.

When applicants enter the Employment Department the superintendent selects those whose general appearance as to cleanliness and deportment is favorable, and who in manner, in address, in conversation and in apparent honesty of purpose in applying for the position, commend themselves to his judgment as being worthy of further examination.

Their eyesight and hearing are then tested and the names of those to whom they refer are taken, together with the time and length of employment by each person or concern given as a reference.

These references must cover a considerable period previous to the date of application and must be prima facie satisfactory.

An application blank is then filled in, signed and sworn to. This application contains the representations of the applicant as to various matters deemed pertinent by the superintendent. The persons or concerns referred to by the applicant are then written to and if satisfactory replies are received as to the applicant's antecedents and as to his character, he is accepted.

He is then assigned to a division where he is instructed by one man until he is considered by his instructor competent to perform his duties. He then goes on one or two trips on each route in the division. This period of instruction takes about a week for a conductor and about nine days for a motorman. He is then sent to the Employment Office again for examination. The examination for a conductor is a written one and consists of questions upon the rules prescribed for running cars and is supplemented by oral questions on special points relating to the enforcement of rules and the sale and reception of checks, etc.

The examination for a motorman is upon the rules for running cars and also the proper way to use the rheostat, controller and brake; also upon cutting out motors and upon slight repairs that could be made on the street without delaying traffic. The applicant must demonstrate how not to abuse the apparatus of a car and how not to waste power.

If unable to pass the examination, he is sometimes given a second trial, but if he finally fails he is rejected. If, however, he passes the examination satisfactorily he is given employment on probation for three weeks.

During this period he is watched by the foreman of his station, by the inspectors and starters, who are furnished with blanks giving his name, number, date of appointment, date of examination and when his probation period expires, with instructions to ascertain where the man is at work each day and to note his conduct and ability to perform the duties required of him.

If the reports are favorable and the division superintendent considers him a suitable person to be employed, he is finally hired.

All this means that only pretty good men can get on the cars as conductors or motormen, and should deter hundreds from applying, because they do not possess the necessary mental, moral or physical requirements.

The system, however, does result as a rule in the selection of intelligent, competent and urbane employes, the best of whom in time are sure to be advanced, for a trained street railway man commands a good compensation.

In the operation of cars division superintendents have charge in their several divisions. They also have an oversight of track repairs, overhead line work, care of cars, etc. The car house work is divided and there are two sets of men. One attends to pit work and the other to floor work. Both are under the same foreman. Pit work includes all the mechanical work such as repairs of cars, motors, controllers, brakes, etc. Floor work consists of cleaning cars, operating transfer tables and keeping the car houses clean. The watchmen and boilermen are included in the floor work division. There are 184 men employed in the pits and 171 on the floors.

Each car house has a "starter" who has charge of the running out of the cars on schedule time. A force of "inspectors" are stationed along the different routes covering the entire city whose duties are to keep the cars properly spaced and see that the men observe the proper rules. In case of blockades, break downs or the like these inspectors take charge.

#### FEEDER SYSTEM.

The work of maintenance and construction on all overhead lines is performed by the company through the following organization: In the department of wires and conduits under the general supervision of a superintendent of wires, the work is carried on subdivided into seven emergency crews and a central construction and maintenance crew. The railway system is divided into seven districts in which emergency crews are stationed, acting under the supervision of the superintendent of the division in which the crew may be located. The crews numbering from four to seven men each are in charge of foremen whose duty it is to direct the work, account for all material used, keep all records of calls and labor and see that the rules of the company are faithfully observed. The quarters of the crew are connected by telephone with all the offices, power stations and street boxes belonging to the company, and also with the fire alarm system of the city or town in which the crew is located. It is the duty of the emergency crews to keep the trolley lines in their respective district in good repair, answer all emergency and fire alarm calls, and when not out on calls or maintenance duty, they must hold themselves in readiness for calls at any hour of the day or night. Comfortable quarters are furnished the men where they are supposed to remain on duty, each putting in six days out of seven.

The crew is furnished with a plan showing all the feeder and trolley lines upon which they may have occasion to be called. Trolley sections are shown giving the switch boxes by which they are controlled, and every detail showing the relation of feeders and trolley wires, and of the different power stations, which may be feeding into the district. Each crew has at its command an emergency wagon, a folding tower wagon, and a pair of horses.

Besides the emergency crews there is the main construction force, made up of from 60 to 80 men. All new construction work and heavy maintenance work is performed by this force. This crew, made up of inspectors, linemen, groundmen and laborers, is divided into three gangs, one whose duty it is to work on feed wires and poles, another on trolley wires, and the third on underground conduit and cable work. The scope of the department of wires and conduits embraces the supervision and maintenance of over 13,000 poles, nearly 300 miles of trolley wire, over 425 miles of feeder and return wires, and about 10 miles of underground conduits, aggregating nearly 130 miles of duct and carrying some 230 miles of feeder cables and return.

Heavy cylindrical three joint poles in sizes ranging from No. 1 to extra heavy No. 4 are used throughout the system, excepting where joint ownership exists with an electric lighting or telephone company, and here square hard pine poles are used.

The trolley wire used throughout the system is No. 0 hard drawn copper of a conductivity averaging about 97 to 98 per cent. For overhead feeder lines a flexible 500,000-c. m. wire is now used almost entirely in the layout of new lines.

In span wire construction a No. 4 galvanized iron wire is used



in preference to the old construction with three-ply No. 11 wire. All trolley line materials such as hangers, ears, pull-offs, frogs, crossovers, etc., are of composition metal and mostly of design based upon the experience of the road. The Aetna type of insulator, made by the Albert & J. M. Anderson Company, is generally used.

Each division has a wrecking wagon to move on immediate notice of a break-down or other accident to a car on the track.

For general repairs of track each division has its own set of men. New construction and extensive repairs are done under the direction of the superintendent of tracks.

The superintendent of car shops has charge of the repair shops which are situated at Roxbury on Washington street, near Bartlett street.

Time tables and routes are arranged and approved by the superintendent of transportation.

Division superintendents make daily, weekly and monthly reports to the superintendent of transportation and all complaints

amount of pleasure travel. The officers are: President, A. F. Breed; vice-president and clerk of corporation, E. Francis Oliver; treasurer, Charles Williams; auditor, Fred E. Smith; general counsel, Proctor M. Warren; general manager, R. C. Foster.

Second to be joined with the Boston street railway system, and second in point of importance, is the system of the Quincy & Boston Street Railway Company, which operates cars through the city of Quincy, and the towns of Weymouth and Milton. The road is interesting as having part of its roadbed on the route of the first steam railway run in America. The total mileage of the Quincy & Boston Street Railway is 27.39 miles of single track. Through its connections, with which the operation of through routes is possible, cars are run from the Boston boundary line, at Neponset, to Nantasket and other summer resorts on the south shore, a large revenue being derived in summer from the operation of these through routes. The principal office of the company is at Quincy, Mass., from which the lines of the street railway radiate in every direction. The officers of this



Laying Vitrified Clay Conduit

West End Cement Lined Pipe Conduit

Trench Ready for Ducts

are referred to and investigated by him. Applications for extra or special cars are made to the same official.

## SUBURBAN CONNECTIONS WITH THE BOSTON ELEVATED RAILWAY SURFACE LINES.

With the development of population in the suburbs of Boston and the surrounding cities, it was only natural that other lines should be connected with the surface lines of the Boston Elevated Railway Company. The first of these was the Lynn & Boston Railroad, which connects with the tracks of this company in four places, and is the only system running its street cars into the heart of the city over the tracks of the Boston Elevated Railway Company. The Lynn & Boston Railroad Company operates some 163 miles of single track, the center of the system being in Lynn, where the general offices are located, at 333 Union street. Lines of cars are run in the cities of Lynn, Boston, Chelsea, Everett, Malden, Salem and Woburn and the towns of Hamilton, Beverly, Danvers, Marblehead, Melrose, Peabody, Revere, Saugus, Stoneham, Wenham and Swampscott, connections being made with the Boston surface lines in Boston, Chelsea, Everett and Malden. The territory covered by the Lynn & Boston Railroad includes, in addition to the thriving and populous cities and towns named, many of the famous summer resorts on the north shore of Massachusetts Bay, places of historic interest, and Lynn Woods, an important part of the Massachusetts State Park system, which is reached by lines of street railway on both sides. The company enjoys an especially large

company are: John R. Graham, president; Fred H. Smith, treasurer and clerk of corporation; Roger H. Wilde, auditor; B. J. Weeks, superintendent.

One of the more recent lines to be connected with the surface lines of the Boston Elevated Railway Company is that of the Commonwealth Avenue Street Railway Company, which operates some 11 miles of single track, connection being made at the boundary line between Boston and Newton. The line runs through a reservation boulevard for about five miles, to Norumbega Park. This is a large park and pleasure resort owned and controlled by those interested in the street railway company. It is on the Charles river, and while its establishment, some years ago, was looked upon with some doubt, as an experiment, it has been a great success, the travel to this resort on Sundays and holidays being very large. The officers of the company are: Adams D. Clafin, president; Leonard D. Ahl, treasurer; William H. Coolidge, clerk of corporation and general counsel; L. H. McLain, superintendent. The offices of the company are at Newtonville.

The district to the south of Boston has recently been brought into connection with the city by establishment of two electric lines, connection being made with the Boston Elevated Railway Company by both lines at Forest Hills. The West Roxbury & Roslindale Street Railway Company operates cars in that portion of the city of Boston south of Forest Hills, commonly known as the "West Roxbury district," and also in the town of Dedham. This company has about ten miles of single track, and owns and

operates a public park, known as Westwood Park, which has recently been opened. The cars of the company run past the Stony Brook Reservation, which is a part of the State Park system. The general offices are at Roslindale, Mass. The officers are: Thomas T. Robinson, president; Frederick H. Terrell, treasurer and clerk of corporation; George W. Rounds, superintendent. The other line from Forest Hills is the Norfolk Suburban Street Railway Company, which also makes connection with the Boston system at Milton Lower Mills. This company operates about 11½ miles of track in the city of Boston, Hyde Park and Dedham, with offices at Hyde Park. Like the other line, it runs near the Stony Brook Reservation, which it crosses, just before entering Dedham. The officers are: James D. McAvoy, president; Galen L. Stone, treasurer and clerk of corporation; Thomas F. Fannce, auditor; Charles F. Jenney, general counsel.

At Medford connections are made by the Boston Elevated Railway Company with the North Woburn Street Railway Company running through the towns of Winchester and Woburn. This street railway has 7½ miles of track, and offices at North Woburn. The officers are: A. F. Breed, president; David H. Sweetser, treasurer and clerk of corporation; John S. Brackett, superintendent.

The Arlington & Winchester Street Railway Company operates 3.13 miles of track through the towns of Arlington and Winchester, connecting with the tracks of the Boston system at Arlington. It has general offices at Wakefield, Mass. The officers are: Charles F. Woodward, president; George A. Butman, treasurer and clerk of corporation; Charles F. Heath, superintendent.

In the district lying to the west of Boston is the city of Newton and many populous towns, the city of Newton embracing a dozen pretty villages, generally spoken of collectively as "The Newtons." All these are connected with Boston by means of the surface lines of the Newton Street Railway Company, the Newton & Boston Street Railway Company, and the Wellesley & Boston Street Railway Company, lines being operated by these corporations in the cities of Newton and Waltham, and the towns of Watertown and Needham. Connections with the Boston system are made at Newton and Watertown.

## THE ELEVATED LINES.

The street railway conditions in Boston are peculiar to that city and from some standpoints they will soon be the most perfect of any large city in the world. The elevated road, the subway and practically all the surface lines in Boston will be under the one management. The surface lines radiate from the business center to all resident districts in the city and suburbs. To relieve the congested traffic concentrated in a small area the subway was constructed, and in order to further improve transportation facilities the elevated lines are to be built through the center of the city.

The Boston Elevated Railway Company was incorporated in 1894 and last year additional powers were granted by the Massachusetts Legislature in an amendment to the original act. The company was authorized to construct an elevated railway, lease the subway for 20 years and lease and operate the lines of the West End Street Railway Company. At each station free transfers must be given and connection made between the surface and elevated cars. At the terminal stations the surface cars will ascend an incline, having a grade of 5 per cent, to the elevated structure, and throughout almost the entire length of the elevated road it will be paralleled by surface lines beneath the structure.

The present plans, which have been approved by the Massachusetts Board of Railroad Commissioners, include the immediate construction of seven miles of elevated road which, with the 11 stations to be built, will involve an expenditure of \$5,000,000. Contracts have already been let for structure, about 1,800 ft. in length, on the new Charlestown bridge. The third rail system of electric traction will be used in operating the elevated cars, which in construction and equipment will closely resemble those now in service in Chicago. Two general forms of structure will be adopted. For narrow streets a double row of posts set at the curb lines will support longitudinal and transverse half-lattice girders. In broad streets the columns will be placed just far

enough apart to permit the surface cars to run between them.

It is expected that all these comprehensive plans will be carried out within the coming year. The operation of the elevated road with over 300 miles of surface lines will be with one exception the largest street railway undertaking in the world. The same success with which the West End Company has been managed may confidently be anticipated for the newer and greater company.

### OFFICIALS OF THE BOSTON ELEVATED RAILWAY COMPANY.

William A. Gaston, President.  
 William A. Bancroft, Vice-President.  
 John T. Burnett, Secretary.  
 William Hooper, Treasurer.  
 E. G. Ware, Receiver.  
 Gaston & Snow, General Solicitors.  
 Hyde & Baxter, Managers Claim Department  
 J. H. Goodspeed, Comptroller.  
 Prentiss Cummings, Advisory Counsel.  
 Henry F. Woods, Purchasing Agent.  
 J. H. Studley, Jr., Assistant to Purchasing Agent  
 G. A. Kimball, Bureau of Elevated Lines.  
 D. L. Prendergast, Bureau of Real Estate.  
 H. L. Wilson, Auditor.  
 J. T. Dwyer, Chief Clerk, Bureau of Audit.  
 J. H. Neal, Chief Clerk, Branch Bureau of Audit.

### BUREAU OF SURFACE LINES

C. S. Sergeant, Second Vice-President.  
 Howard F. Grant, Secretary to Second Vice-President  
 Julius E. Rugg, Superintendent of Transportation  
 J. H. Hildreth, Supervisor of Time Tables  
 Joseph W. Moore, Superintendent Division 1  
 Joseph M. Gould, Superintendent Division 2  
 George W. Hendry, Superintendent Division 3.  
 E. J. McClench, Superintendent Division 4  
 George R. Tripp, Superintendent Division 5.  
 John H. Studley, Superintendent Division 6.  
 Joseph Dee, Superintendent Division 7  
 Charles W. Hawes, Superintendent Division 8.  
 H. A. Pasbo, Superintendent Division 9.  
 Charles F. Baker, Superintendent of Motive Power and Machinery.  
 Thomas W. Bevan, Superintendent of Power Stations  
 John L. Mitchell, Superintendent of Machine Shops.  
 H. M. Ballard, Superintendent Car Equipment Shops.  
 H. L. Libby, Superintendent Car Shops.  
 H. P. Quick, Chief Mechanical Draughtsman  
 William S. Collins, Inspector of Motor Car Repairs  
 Charles H. Hile, Superintendent of Wires  
 Richard Hapgood, Superintendent of Tracks.  
 A. L. Plimpton, Civil Engineer.  
 Roger W. Conant, Electrical Engineer.  
 Benjamin W. Shippee, Superintendent of Buildings.  
 Richard T. Lavin, Superintendent of Employment.  
 C. E. Learned, Superintendent of Inspection.  
 Frank T. Lewis, General Storekeeper.  
 H. W. Peters, Inspector of Stables.  
 H. W. Brace, Trackmaster, Division 1  
 Solomon D. Grimes, Trackmaster, Division 2.  
 George R. Archibald, Trackmaster, Division 3  
 Owen Doherty, Trackmaster, Division 6.  
 George E. Bridges, Trackmaster, Division 7  
 George E. Draper, Trackmaster, Central Division  
 Harry E. Trever, Trackmaster, Division 9.

## SOUVENIR PHOTOGRAPHS OF BOSTON.

The largest and best collection of photographs of places of local and historical interest in and around Boston will be found at the studio of Charles Pollock, 10 Hamilton place. He furnished many of the views for the illustrations in this issue of the Review and has made a specialty of gathering a large line of the old historic scenes in eastern Massachusetts.



BOSTON, 1600.





Frog Pond



Frog Pond



View from Arlington St



Beacon St. Mall



General View



State House



Pond

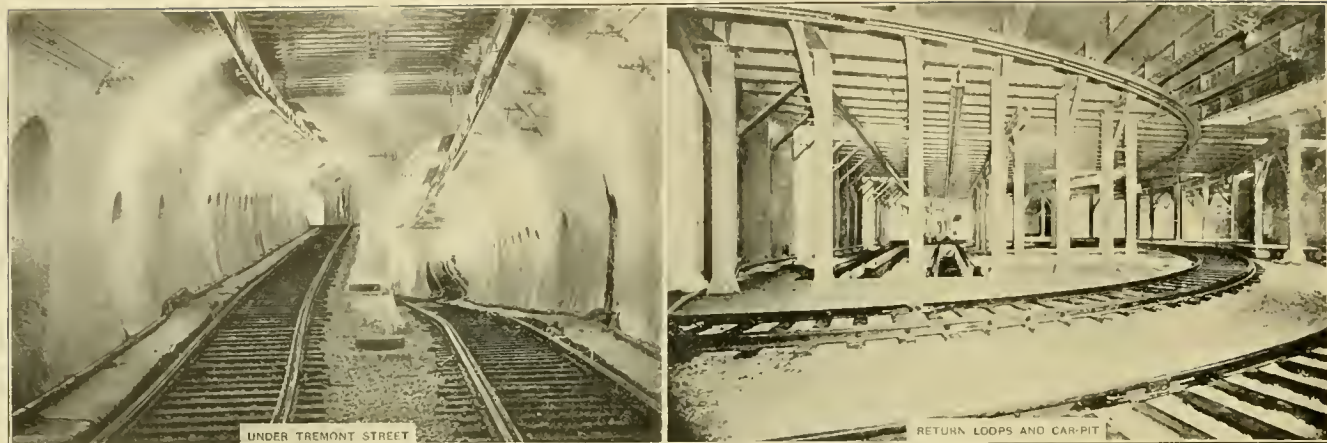


Fremont St



Fremont St. Mall





## THE BOSTON SUBWAY.

The Boston subway is far-famed for the boldness of its conception, the engineering difficulties, and its ultimate success, both in construction and operation. The subway is a tunnel, underground passageway 9,498 ft. long, under several of the principal streets, built by the city and leased for a term of 20 years to the West End Street Railway Company. It is by far the largest underground passageway for railways in the world, the four-track portion having a cross-sectional area of 707 sq. ft.

After the introduction of electric traction the cars from all parts of Boston and its suburbs centered in one downtown district, one-quarter mile broad and about one mile long. The two main thoroughfares between the northern and southern portions of the city were Tremont street and Washington street, narrow and tortuous highways. No more serious difficulty ever presented itself to the street railway and municipal officials than the enigma of relieving the congested traffic in this small area. The Boston Transit Commission finally decided that a subway system would be the best solution. An appropriation of \$7,000,000 was made for the work, but the cost has been \$1,500,000 less. The West End Railway Company, or its lessee, pays yearly 4½ per cent of the net cost of the subway, equips the subway with tracks and apparatus, furnishes all power used therein, and bears the expense of repairs and maintenance. The city sold 3½ and 1 per

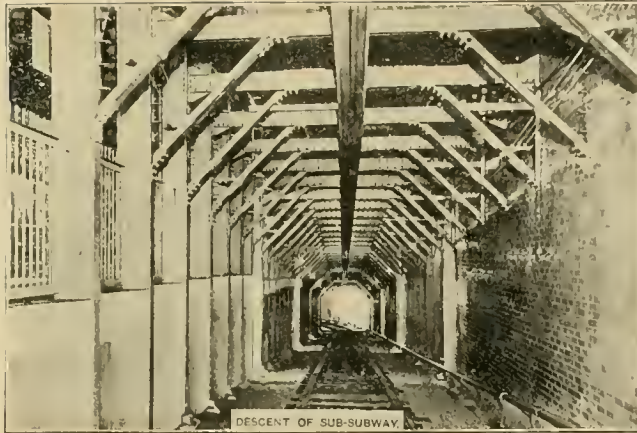
cent bonds and the surplus goes into the sinking fund. From the passage of the Subway Act by the legislature and its acceptance by the city in a special election in July, 1894, to the completion of the work there was a stubborn opposition to the project on sentimental, as well as financial grounds, for it was considered an encroachment on the historic Common. The first spadeful of earth was removed in the presence of Governor Greenhalge, on March 28, 1895, and after 29 months of continuous and unremitting labor its completion was witnessed.

It was essential that the subway be close to the surface and not low-level tunnel, as it passes through the great shopping district ready means of ingress and egress must be provided without obstructing the streets already narrow and crowded. Work had to be carried on without undue interference with the network of sewers, electric conduits, water and gas pipes under the streets and with the ordinary street traffic. Great care was exercised not to undermine or weaken the foundations of the valuable buildings along the route.

For convenience in construction the subway is divided into 12 sections. Sections 1, 2 and 3 consist of a two-track subway commencing at the incline at the Public Garden west of Charles street and extending to the intersection of Boylston and Tremont streets. The four-track subway begins at this point and runs un-







DESCENT OF SUB-SUBWAY.



UNDER BOYLSTON-STREET MALL.

der the Tremont street mall to Temple place, where the tracks separate to form the Park street station. In this part of the tunnel the roof is flat, supported by brick arches turned between I-beams with diagonal struts connecting the vertical and horizontal beams across the corners. The two-track subway is 24 ft. wide; the four-track is 48 ft. across, the roof being supported in the middle by a row of steel columns.

Sections 4 and 5 consists of two two-track inclines, and a length of two-track subway which finally runs into two separate single-track subways; one, for the south-bound cars, is 39 ft. below the surface and the other, for the north-bound cars, is 17 ft. above it, but the two converge into a double barrel subway, both being brought to the same level before reaching Eliot street. Tremont street, being but 32 ft. between curbs and a very busy thoroughfare, it was deemed best to tunnel 1,085 ft. of section 6, and this was done, the shield being from 6¼ ft. to 13½ ft. below the surface. The open inclines are lined with retaining walls on cement foundations. The maximum grade in the subway is 8 per cent and there are several others of 5 per cent.

The 5.3 miles of single track are laid with 85-lb. T-rails which are bonded with two No. 0000 wires and cross connected to 500,000-e. m. cables returning to the station. To avert any danger of derailment a 43-lb. steel guard is bolted to the inside of each rail. The foundation is of broken stone ballast, 12 to 20 in. deep, upon which chestnut ties are laid. Figure 8 trolley wire, with a cross section of 360,000 e. m., is carried in an inverted trough of eypress wood which is fastened to the iron work of the roof and insulated with sheet rubber. Hangers of special design are spaced 12 ft. apart. Drains are provided beneath the tracks

which carry the water into dry-wells, from which it is removed to the sewers by means of rotary pumps operated by G. E. motors, automatically started and stopped. To insure perfect ventilation 8-ft. fans, run by 500-volt motors, exhaust the air from the subway and deliver it to eight ventilating chambers leading to the exterior. The whole underground construction is of stone, brick and iron.

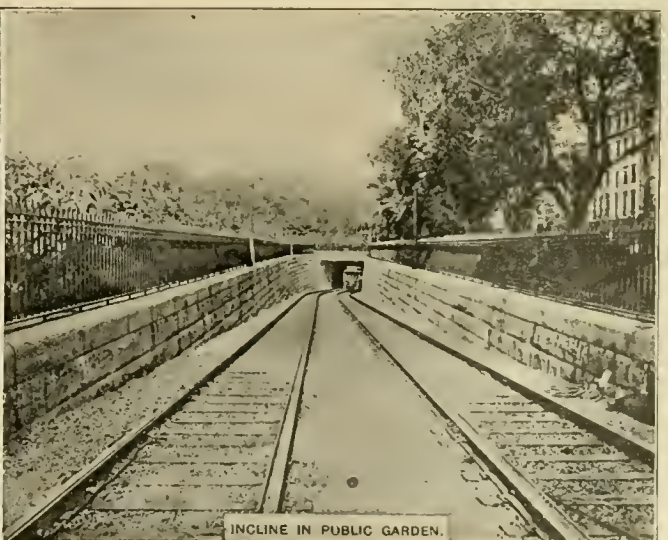
Entrance to the subway is through handsome granite, glass-roofed structures, located two or three blocks apart, and down a flight of 30 steps. Tickets are sold at three different offices at each station and collected by the conductors before the cars emerge from the subway. The platforms are smooth, artificial stone and between the tracks is a barrier of netting to prevent passage back and forth across the tracks. The stations are lined with white enameled brick which reflect the light from the arc lamps, making it as light as day. The subway is lighted by 600 incandescent lamps, connected in series of five and spaced at equal intervals on three circuits, and by 75 arc lamps of the constant potential type, five in series on a 500-volt circuit. The electric heaters are located in the ticket offices. An electric block signal system is also installed. All the stations are connected with the other parts of the railway system by telephone.

For ordinary traffic about 5,500 car-trips are made each way in the subway each day, and on the first day after the opening over 200,000 passengers were carried through it.

G. G. Crocker, chairman of the Boston Transit Commissioners, and H. A. Carson, chief engineer, were ably assisted in this great work by C. S. Sergeant, general manager, and C. F. Baker, master mechanic, of the West End Street Railway Company.



SCOLLAY SQUARE, JULY 15, 1897.



INCLINE IN PUBLIC GARDEN.



## THE ASSOCIATION AND ITS WORK.

The American Street Railway Association having, after 17 years, returned to Boston, it is fitting to devote a few words to that first meeting and to the work which the Association has accomplished in the meantime.

Though nominally the American Street Railway Association this year meets in Boston for the second time it is really the first convention there, as the meeting at Young's Hotel in 1882 was only to effect an organization.

Under the date, November 8, 1882, H. H. Littell, then superintendent of the Louisville City Railway Company, issued a circular

reports of these committees the convention adjourned and a meeting of the Association immediately called, there being 35 companies which had joined the Association. The Association ratified the organization and adjourned. After the meeting the delegates were entertained by the street railways of Boston at a banquet, and at all subsequent meetings the banquet has been one of the most pleasant features.

A complete list of the cities where the conventions have been held and the presiding officer is as follows:

Boston .....	Moody Merrill .....	1882
Chicago .....	H. H. Littell.....	1883
New York .....	William H. Hazzard.....	1884
St. Louis .....	*Calvin S. Richards.....	1885
Cincinnati .....	Julius S. Walsh.....	1886
Philadelphia .....	*Thomas W. Ackley.....	1887
Washington .....	Charles B. Holmes.....	1888
Minneapolis .....	George B. Kerper.....	1889
Buffalo .....	Thomas Lowry .....	1890
Pittsburg .....	Henry M. Watson.....	1891
Cleveland .....	John G. Holmes.....	1892
Milwaukee .....	D. P. Longstreet.....	1893
Atlanta .....	Henry C. Payne.....	1894
Montreal .....	Joel Hurt .....	1895
St. Louis .....	H. M. Littell.....	1896
Niagara Falls .....	Robert McCulloch .....	1897
Boston .....	Albion E. Lang .....	1898

\*Deceased.

Each of the annual conventions has been the occasion of the presentation and discussion of technical papers on subjects in which the street railway men were interested, and these papers have been preserved in the published "Reports" now 16 in num-



A. E. LANG,  
President.

ber letter to the street railway companies of the United States and Canada, requesting them to send representatives to a convention to be held in Boston, on December 12, 1882.

It was the original intention of Mr. Littell to have the officers of 10 other companies join him in issuing the call, but he yielded to the suggestions of the others that a circular signed by a limited number of companies might engender prejudice amongst those others which had not been asked to join, and signed the call alone.

As a preliminary to the National Association of street railways, it was thought that an Ohio State Association would be highly desirable and November 12, 1882, a call for a meeting was issued by R. B. Hopple, vice-president of the Cincinnati Street Railway Company, in behalf of the Cincinnati companies. The proposed meeting was held at Cincinnati, November 22, 1882, and delegates from the companies at Cincinnati, Cleveland, Columbus, Dayton and Toledo united to form the Ohio State Tramway Association, delegates from which attended the Boston meeting.

On the appointed date Mr. Littell called the meeting to order at Young's Hotel in Boston.

Moody Merrill, president of the Highland Street Railway Company, of Boston, was chosen chairman of the meeting, at which there were present 56 delegates representing 55 roads. A committee was appointed to draw up constitution and by-laws, and a committee on nominations. After the convention had adopted the



T. C. PENINGTON,  
Secretary.

ber. Many of the topics of vital interest then are now obsolete, but others, for instance, "The Use of Salt," are almost as much alive today as in the time of animal traction.

In 1883 and 1884 the papers presented at the conventions were reports of committees of three men each; in 1885 the committees comprised but two men; and ever since (save in a few instances) but one man has constituted the committee, though his paper is still officially known as a "report."



## OFFICERS A. S. R. A.

The officers of the Association are:  
 President, Albion E. Lang, president Toledo Traction Company, Toledo, O.  
 First Vice-President, W. Caryl Ely, president Buffalo & Niagara Falls Electric Railway Company.  
 Second Vice-President, John A. Rigg, president United Traction Company, Reading, Pa.  
 Third Vice-President, Edward G. Connette, general manager Nashville Street Railway, Nashville, Tenn.  
 Secretary and Treasurer, T. C. Penington, treasurer Chicago City Railway, Chicago, Ill.

The Executive Committee comprises the president, vice-presidents and—

Robert McCulloch, vice-president and general manager Citizens' Railway, Cass Avenue & Fair Grounds Railway and St. Louis Railroad Companies, St. Louis, Mo.

C. Densmore Wyman, general manager New Orleans Traction Company, New Orleans, La.

Henry C. Moore, president Trenton Passenger Railway Company, Consolidated, Trenton, N. J.

John M. Roach, vice-president and general manager North Chicago Street Railroad Company, Chicago, Ill.

Robert S. Goff, president and general manager Globe Street Railway Company, Fall River, Mass.



W. C. ELY.



JOHN A. RIGG.



E. G. CONNETTE.



ROBERT MCCULLOCH.



C. D. WYMAN.

What has been done at these previous meetings will be found of great interest to the modern manager, especially if he wish to look up the history of a subject, and to enable him to find these data we have compiled a classified index. This comprises titles of papers, and discussions, with some abstracts of the sub-heads, compiled from the reports, and constitutes an epitome of the 16 separate tables of contents (aggregating nearly 50 pages), arranged alphabetically with a few of the most important cross-references, and will repay the time spent in its perusal.

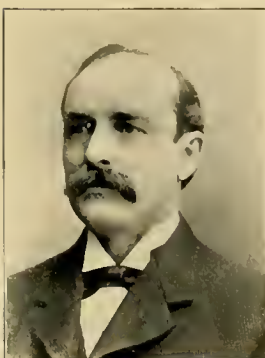
In March, 1884, the Association undertook the publication of the most important legal decisions which affected street railways, and these were published for several years at the rate of one each month. They are now published three or four times each year.

The membership statistics of the Association show an interesting phase of the development of the industry, illustrating the tendency to centralization found everywhere in this country at the close of the century. The Association left Boston 16 years ago with 35 members, and the number steadily increased to 205 in 1892, when the high-water mark was reached. From 1892, one number of member companies has decreased, the decrease being due almost entirely to the consolidation of companies, the interests represented by them having vastly increased, and in 1897 the membership was 161—just what it was in 1859.

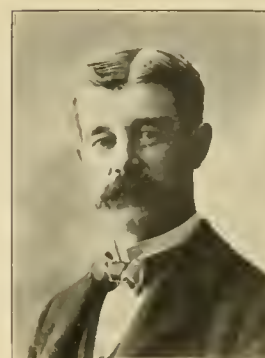
The figures are as follows:

Year.	Members.	Year.	Members.
1852.....	35	1890.....	169
1853.....	62	1891.....	184
1854.....	74	1892.....	205
1855.....	125	1893.....	197
1856.....	141	1894.....	187
1857.....	153	1895.....	173
1858.....	157	1896.....	160
1859.....	161	1897.....	161

The decrease in membership does not by any means indicate a decline of the power and influence of the Association; quite the contrary. The number of delegates of member companies in attendance at the Niagara Falls convention was 287, which is considerably in excess of the attendance at any preceding annual meeting. In addition to this the number of suppliers, visitors and representatives of non-members is on the increase, all of which betokens a widening scope for the work of the Association.



J. M. ROACH.



R. S. GOFF.

## PROGRAM.

## TUESDAY, SEPTEMBER 6.

10 a. m. Meeting called to order by President Lang.  
 Roll call.  
 Invitation extended to join the Association.  
 Address of the President.  
 Report of the Executive Committee.  
 Report of the Secretary and Treasurer.  
 Paper—"The Comparative Earnings and Economy of Operation between Single and Double Truck Cars for City Use." Richard McCulloch, electrical engineer Cass Avenue and Citizens' Railway Companies, St. Louis, Mo.  
 Paper—"Municipal Ownership of Street Railways."  
 Afternoon. Trip to Concord and Lexington.  
 Evening. Reception at the Hall.

## WEDNESDAY, SEPTEMBER 7.

9:30 a. m. Paper—"Maintenance and Equipment of Electric Cars for Railways." M. S. Hoskins, electrician Columbus Street Railway Company, Columbus, O.

Paper—"The Carrying of United States Mail Matter on Street Railways." W. S. Dimmock, general superintendent Omaha & Council Bluffs Railway & Bridge Company, Council Bluffs, Ia.

Appointment of Committee on Nomination of Officers and Next Place of Meeting.

While the convention is in session the visiting ladies will be taken to the various points of local and historic interest.

Afternoon. Excursion down the harbor with clam bake at Nantasket Beach.

## THURSDAY, SEPTEMBER 8.

9:30 a. m. Paper—"To What Extent Should Railway Companies Engage in the Amusement Business?" W. H. Holmes, general manager Metropolitan Street Railway Company, Kansas City, Mo.

Paper—"Inspection and Testing of Motors and Car Equipment by Street Railway Companies." Frederick B. Perkins, electrical engineer Toledo Traction Company, Toledo, O.

Election of Officers.

Drive through the park for the ladies.

Afternoon. Trip to Plymouth.

7 p. m. Annual Banquet at the Hotel Brunswick.

## FRIDAY, SEPTEMBER 9.

9:30 a. m. Paper—"Cost of Electric Power for Street Railways at Switchboard; Both Steam and Water." R. W. Conant, electrical engineer Boston Elevated Railway Company, Boston, Mass.

Report of Committee on Standing Rules for Government of Conductors and Motormen.

Unfinished Business.

Installation of Officers.

Adjournment.

Shopping trip for the ladies.

Afternoon. Trolley excursion to Norumbega Park.

## COMMITTEES.

## GENERAL.

C. S. Sergeant, 101 Milk street, Boston, Chairman.  
 E. C. Foster, 333 Union street, Lynn.  
 J. E. Rugg, 101 Milk street, Boston.  
 C. S. Clark, 8 Oliver street, Boston.  
 A. A. Glasier, 104 Ames building, Boston.  
 C. Q. Richmond, North Adams.  
 John R. Graham, 280 Washington street, Boston.  
 Robert S. Goff, Fall River.  
 P. L. Saltonstall, 28 Exchange building, Boston.  
 E. P. Shaw, 316 Exchange building, Boston.  
 F. H. Dewey, Worcester Consolidated Street Railway Company, Worcester.

## ON ENTERTAINMENT.

P. L. Saltonstall, Boston, Chairman.  
 H. F. Eldredge, Portsmouth.  
 A. B. Bruce, Lawrence.  
 C. C. Pierce, Boston.  
 C. E. Barnes, Boston.  
 C. W. Wilson, Boston.  
 J. F. Shaw, Boston.

J. H. Goodspeed, Boston.  
 J. H. Cunningham, Boston.  
 B. J. Weeks, Quincy.  
 W. W. Sargent, Fitchburg.

## ON HALLS, HOTELS AND REGISTRATION.

E. C. Foster, 333 Union street, Lynn, Chairman.  
 John F. Morrill, Quincy.  
 J. N. Akarman, Worcester.  
 J. H. Studley, Jr., Boston.  
 J. E. Rugg, Boston.  
 W. F. Pope, Boston.  
 R. N. Wallis, Fitchburg.  
 H. B. Parker, Boston.  
 A. E. Smith, Springfield.  
 George F. Seibel, Taunton.

## ON EXHIBITS.

W. F. Pope, 104 Ames building, Boston, Acting Chairman.  
 H. F. Woods, Boston.  
 E. C. Foster, Lynn.  
 C. F. Baker, Boston.  
 E. P. Shaw, Jr., Boston.  
 Franklin Woodman, Haverhill.  
 R. S. Goff, Fall River.  
 J. H. Studley, Jr., Boston.  
 Maurice Hoopes, Lynn.  
 A. C. Gardner, New Bedford.  
 Edwin S. Webster, Boston.  
 Charles S. Clark.

## ON TRANSPORTATION AND INFORMATION.

Julius E. Rugg, Chairman.  
 N. H. Heft, Boston.  
 H. B. Rogers, Brockton.  
 J. F. Wattles, Boston.  
 Fred H. Smith, Quincy.  
 A. E. Gordon, Boston.  
 N. E. Morton, Lawrence.  
 C. E. Woodward, Wakefield.  
 Winthrop Coffin, Boston.  
 H. H. Reed, Fall River.  
 H. F. Grant, Boston.

## BANQUET.

A. A. Glasier, Chairman.  
 W. A. Baneroff, Boston.  
 Prentiss Cummings, Boston.  
 C. S. Clark, Boston.  
 E. P. Shaw, Boston.  
 E. C. Foster, Lynn.  
 S. M. Thomas, Taunton.

## HOTEL RATES.

Leading Boston hotels have made the following rates to attendants upon the convention. The first five hotels are all within five minutes' walk; the others are reached by cars which pass the entrance to the hall:

Brunswick, American plan, \$4 per day and up.  
 Vendome, American plan, \$4 per day and up.  
 Thorndyke, European plan, \$2 per day and up.  
 Nottingham, European plan, \$2 per day and up.  
 Victoria, European plan, \$2 per day and up.  
 Turaine, European plan, \$2 per day and up.  
 Parker, European plan, \$2 per day and up.  
 Young's, European plan, \$2 per day and up.  
 Copley Square, European plan, \$2 per day and up.  
 The Brunswick is headquarters, and the Vendome, under the same management, is near by.

## REVIEW HEADQUARTERS.

The office of the REVIEW at the convention will be in space No. 232, Convention Hall, which will be found next to the Bureau of Information, and directly opposite the main stairway leading to the Association meeting rooms on the second floor. We shall be glad to have our friends drop in, occupy the easy chairs and make themselves generally at home.



## INDEX TO A. S. R. A. REPORTS.

- Accident, Cable, at Cincinnati—1887, p. 119. Letter from G. B. Kerper.
- Accidents and Complaints, Best Method of Treating—1894, p. 54. By P. M. Dyer. Discussion.
- Accidents, Cause, Prevention, and Settlement of—1886, p. 31. By Calvin A. Richards. General discussion.
- Accidents, The Prevention of, etc.—1897, p. 168. By W. J. Hield.
- Accounts. See Standards.
- Accounts, Uniform System of—1884, p. 153. Report by E. K. Stewart, H. R. Harding and J. C. Dessalet. System of the Louisville City Railway Company.
- Accounts, Uniform System of Street Railway—1894, p. 65. By H. I. Bettis. Discussion.
- Air-Brake, Present Status of the—1895, p. 34. By E. J. Wessels. Discussion.
- Booster on Electric Railway Circuits, The Use of the—1894, p. 195. Special paper by J. H. Vail and S. H. Wynkoop.
- Brakes for Steep Grades—1888, p. 122. Brief discussion. Also, pp. 125-127.
- Brakes, Power v. Hand—1894, p. 181. Special paper by E. J. Wessels.
- Brake Shoes—1894, p. 152. Special paper by D. F. Henry and Powell Evans.
- Buildings—1883, p. 51. Report by A. W. Wright, J. B. Slawson and H. M. Watson. Necessity of good hygienic conditions in stables; best arrangements for stables; examples of stable construction.
- Cable Motive Power, Progress of—1886, p. 45. By E. J. Lawless. Data regarding cable roads in San Francisco, Los Angeles, St. Louis, Kansas City, and elsewhere. General discussion.
- Cable Motive Power, A Year's Progress in—1891, p. 77. By J. C. Robinson. History; data on cost of construction, operation, etc.
- Cable Power, Conditions Necessary to the Financial Success of—1888, p. 40. By W. D. Henry. Volume of business, engineering and mechanical construction, machinery, engine performance, carrying pulleys, cables, grips and conduit. General discussion.
- Cable System of Motive Power—1884, p. 145. Report by C. B. Holmes, J. H. Bonn, and Charles Whitten. Review of the progress made in cable traction.
- Cable Motive Power, A Year's Progress in—1890, p. 55. Letter from J. C. Robinson.
- Cable System of Motive Power, Progress of—1885, p. 98. Report by G. B. Kerper and A. D. Whitten. Data as to cost of cable construction in Chicago and Cincinnati.
- Car-House and Stables, Location and Construction of—1888, p. 63. By C. D. Wyman. Light, ventilation, manure pit, drainage, location, construction, disinfection, protection against fire, rooms for employes.
- Cars, Eight-Wheel—1887, p. 84. Remarks by Mr. Humphrey; discussion.
- City and Suburban Electric Railways—1894, p. 97. By E. C. Foster.
- Conductors' Deposits—1886, p. 72. General discussion.
- Construction, A Model Electric Railway Roadbed and Underground Wiring—1892, p. 73. By G. W. Baumhoff. Survey, excavation, ties, rails, chairs, joint supports, paving, underground wiring. Discussion.
- Construction, Overhead Electric, A Perfect—1892, p. 121. By Charles H. Smith.
- Construction, Overhead Electric, Modern—1896, p. 128. By Benjamin Willard.
- Construction of New Road, Completed—1884, p. 103. Report by William Wharton, Jr., W. C. Lange and J. H. Anderson. Rails, ties, curves, methods of construction and paving. Animated general discussion.
- Construction, Railway—1887, p. 71. By Calvin A. Richards. The stringer and girder systems. General discussion.
- Corporations, Public and State Treatment of—1889, p. 113. By G. H. Scribner.
- “ —1890, p. 93. By G. H. Scribner.
- “ —1891, p. 119. By G. H. Scribner.
- Cost of Motive Power for Street Railways, Relative—1890, p. 70. By R. J. McCarty.
- Cost of Operation of Horse, Cable and Electric Roads, Relative—1892, p. 140. Report by William Ramsey, Frank R. Greene and John L. Heins. Discussion.
- Crossings with Steam Roads, Grade—1892, p. 162. Communication from Massachusetts Street Railway Association.
- Curves, Transition, for Street Railways Operated by Mechanical Motors—1890, p. 138. By E. L. Woolley.
- Damage Cases, Best Method of Settling, etc.—1897, p. 168. By W. J. Hield.
- Development of Street Railways, Novel Schemes for the—1890, p. 81. By B. F. Owen. Various kinds of tickets, parks, park attractions, etc.
- Diseases—See Horses.
- Discipline of Employes—1897, p. 139. By George H. Davis.
- Electricity as a Motive Power—1884, p. 131. Report by E. C. Peters, H. M. Watson and B. F. Leshner. Letter from W. A. Knight, relative to the conduit road in Cleveland. Discussion as to the possibilities of the electric motor.
- Electricity as a Motive Power—1887, p. 30. By William Wharton, Jr. Animated general discussion. Also, pp. 99-109; 121-136.
- Electricity as a Motive Power—1890, p. 104. Representatives of different electric companies present data at the request of the Association. Discussion.
- Electricity as a Motive Power, Conditions Necessary to the Financial Success of—1889, p. 62. By Thomas C. Barr. Discussion.
- Electricity as a Motive Power, The Progress of—1885, p. 68. Report by A. W. Wright and James A. Chase. Resumé of experiments in electric traction. Letter from Bentley-Knight Electric Railway Company. Discussion, pp. 85-98.
- Electricity to Railroads Now Operated by Steam, Application of—1897, p. 150. By N. H. Heft. Discussion.
- Electric Motive Power—1888, p. 85. Discussion, storage, battery system, Love underground conduit, electric railways and motors, data as to cost of construction and operation, consents of property owners.
- Electric Motive Power, Dependent (Overhead or Underground) System of—1891, p. 103. By G. W. Mansfield. Discussion.
- Electric Motive Power, Independent (Storage or Primary Battery) System of—1891, p. 130. By Knight Neffel. Discussion.
- Electric Motive Power, Progress of—1886, p. 77. By T. C. Robbins. Resumé of electric traction experiments and descriptions of various motors. General discussion.
- Electric Motive Power Technically Considered—1890, p. 58. By W. L. Allen. Central station, transmission line, motors; cost of renewals and repairs.
- Electric Motor, A Perfect—1891, p. 56. By H. A. Everett. Discussion.
- Electric Street Railways, Some of the Difficulties Existing in the Construction and Operation of—1897, p. 64. By G. W. Knox.
- Employes, Discipline of—1897, p. 139. By George H. Davis.
- Employes' Mutual Benefit Society, Street Railway—1889, p. 44. By Henry Hurt. Plan of organization of Washington & Georgetown Employes' Association; forms and blanks. Discussion.
- Employes, Selection and Management of—1896, p. 145. By W. F. Kelly. Discussion.
- Engines and Dynamos, Proportions between Rated Capacity of—1893, p. 72. By O. T. Crosby.
- Engines, Power House—1893, p. 53. Report by E. G. Connette, L. H. McIntire and F. S. Pearson. Discussion.
- Entertainments for the Public, Free Music and Other—1895, p. 218. Discussion.
- Express. See Mail.
- Fares, Collection of—1883, p. 100. Report by S. S. Spaulding, Frank DeH. Robison and C. B. Clegg. Various types of fare registers considered. Discussion on registers and punches.
- Feeders for Electric Railways, Some Practical Points on the Construction of Underground—1893, p. 163. Special paper by D. C. Jackson.

- Fires, Obstruction of Tracks by—1886, p. 71. Short discussion. Fire. See Switchboard.
- Freight. See Mail.
- Fuses, Destructive Arcing of 500-Volt—1894, p. 148. Special paper by W. E. Harrington.
- Generators, Direct-Driven—1893, p. 139. By C. J. Field.
- Heating and Lighting—1883, p. 80. General discussion as to stoves and heaters and the advisability of their use.
- Heating and Lighting Street Railway Cars—1893, p. 79. By G. F. Greenwood. Data as to cost and maintenance.
- Heating, Car—1895, p. 220. Special paper by J. F. McElroy.
- History of the Events Leading up to the Formation of the American Street Railway Association—1892, p. 60. By D. F. Longstreet.
- Horse, A Perfect Street Railway—1890, p. 53. By Charles Odell.
- Horses, Diseases Common to Car, and Their Treatment—1885, p. 48. Report by C. B. Thurston and James K. Lake.
- Horses, Food and Care of—1889, p. 104. By G. G. Mulhern. Discussion.
- Horse-shoeing—1893, p. 71. Report by L. Brayton, John Johnson and Henry Sprately. Animated general discussion.
- Horses, Stables and Care of—1884, p. 70. Report by J. E. Rugg, J. E. Brown, T. H. Robillard. General discussion.
- Horse Traction, Cost of—1888, p. 129. Remarks by William Bracken.
- Horses, Work of New—1890, p. 57. Discussion.
- Ice. See Snow.
- Insurance—1894, p. 121. Discussion.
- Insurance, Street Railway Mutual Fire—1887, p. 87. By John Maguire.
- “ —1888, p. 83. Report by C. C. Woodworth, C. D. Wyman and R. Dudley Frayser. Brief discussion.
- “ —1889, p. 41. Discussion of report of committee.
- Joints. See Track.
- Labor and Graduated System of Compensation—1884, p. 160. Report by J. S. Walsh, Jacob Rehm and Harvey N. Rowe. General discussion as to methods of collecting fares and the moral sense of street car patrons.
- Labor and Wages—1883, p. 57. Report by C. C. Woodworth, Moody Merrill and W. R. Merriam.
- Legal Decisions—1887, p. 112. Discussion.
- Lighting—See Heating.
- License—See Taxation.
- Love Underground Conduit in Practice—1893, p. 158. Remarks by Herbert Claude and M. D. Law.
- Magnetic Cut-Outs for Street Railways—1893, p. 151. Special paper by W. E. Harrington.
- Mail, Express and Freight Service on Street Railway Cars—1894, p. 135. By Richard McCulloch.
- Mail on Street Cars, Carrying U. S.—1897, p. 136. Discussion.
- Motors Other Than Animal, Cable and Electric—1889, p. 92. By H. H. Windsor. Steam, gas, compressed air, and chemical motors.
- Motors Other Than Cable or Electric—1887, p. 68. By D. Atwood. Data as to various motors.
- Municipal Ownership of Street Railways—1897, p. 48. By P. F. Sullivan.
- Parks. See Development.
- Patents—1895, p. 162. Report by F. R. Greene and J. W. McNamara.
- Pavement, Wood—1888, p. 72. Discussion.
- Poles, Ties and —1895, p. 153. By N. W. L. Brown.
- Power Distribution and the Use of Multiphase Current Transmission for Ordinary Street Railways—1897, p. 102. By Maurice Hoopes. Discussion.
- Power House, The Modern—1896, p. 80. By Richard McCulloch. Discussion.
- Power, Propelling—1883, p. 86. Report by Tom L. Johnson, William Richardson and J. P. Helfenstein. Horse, mule, steam and cable traction considered. Discussion of “car starters” and cable practice.
- Rails, Continuous, Experiments on the Expansion of—1892, p. 195. Special paper by A. J. Moxham.
- Rail in Cities, Use of T—1893, p. 84. Discussion.
- Rail, T, Construction at Terre Haute, Ind.—1894, p. 105. By Russell B. Harrison. Discussion.
- Rail, T, in Cities; Can It Be Satisfactorily Used?—1894, p. 85. By Strathearn Hendrie.
- Registers—See Fares.
- Revenues of Street Railways Be Increased? How Can—1896, p. 99. By C. D. Wyman. Discussion.
- Rules and Regulations for the Installation of Wiring and Apparatus for Electric Light, Heat and Power—1897, p. 128. Report by Frank R. Ford, delegate.
- Rules Governing Conductors and Drivers—1885, p. 125. Report by D. F. Longstreet and H. H. Littell. Discussion of this and allied subjects, pp. 152-170.
- Salt and Sand on Tracks, Use of—1895, p. 210. Report by D. G. Hamilton and Robert McCulloch.
- Salt—See Snow.
- Sanding Rails—1888, p. 123. Discussion.
- Sanitary Condition of Street Cars—1886, p. 96. By E. Lusher.
- Shops, Machine, for Electric Railways, Economy of —1892, p. 125. By J. H. Bickford. Discussion.
- Snow and Ice, Removing—1883, p. 59. Letter from Robert Bell describing early forms of snow plows. Animated discussion as to the use of salt and its effect on the health of horses.
- Snow and Ice, Track Cleaning and Removing—1884, p. 35. Report by A. B. Whitney, Joab Mulvane and William Hagensweiler. The use of salt; report of Committee on Public Health of Brooklyn; letters from physicians and chemists as to the effect upon the public health of the use of salt.
- Stables—See Horses, Car House.
- Standards for Electric Street Railways—1892, p. 164. Report by O. T. Crosby, H. I. Bettis, E. E. Higgins, C. W. Wason and J. E. Rugg. Nomenclature, ratings, dimensions, accounting. Sub-committee report on standard system of accounts.
- Standards in Electric Street Railway Practice—1891, p. 160. By O. T. Crosby. Ratings, nomenclature, dimensions, accounts. Discussion.
- Standard Rail-head Possible? Is a—1892, p. 216. Special paper by J. F. Ostrom.
- Standard Rules for Electrical Construction—1895, p. 149. Resolution. Remarks.
- Storage Batteries in Connection with Central Stations for Utilizing Surplus Energy for Lighting or Power—1893, p. 101. By C. O. Mailloux. Discussion.
- Storage Battery to Electric Traction, Application of the—1897, p. 73. By Charles Hewitt. Discussion.
- Supplymen, Admission of—1888, p. 131. Discussion as to associate membership in the Association.
- Supplymen, Admission of—1895, p. 173. Discussion.
- Switchboard Fires—1890, p. 69. Letter from D. F. Henry. Discussion.
- Taxation—1888, p. 74. By Winfield Smith. Discussion.
- Taxation—1894, p. 203. Special paper by Allen R. Foote.
- Taxation and License—1884, p. 158. No report; letter from chairman of committee.
- Ties and Poles—1895, p. 153. By N. W. L. Brown.
- Track and Track Joints—1896, p. 46. By M. K. Bowen. Discussion.
- Track Construction—1883, p. 23. Report by Charles Hathaway, V. C. Turner and J. J. Franklin. General discussion ensued as to cost and life of rails, ties, stringers, various kinds of paving, methods of construction, proper location of joints, etc. Mr. Kreismann, of Berlin, spoke on the practice in that city. A. J. Moxham, of the Johnson Steel Street Rail Company, discussed girder rails.
- Track Construction—1886, p. 97. General discussion.
- Track, Repairs of—1885, p. 77. Report by A. J. Moxham and Thomas Lowry. Rails, stringers, joints, spread of track, and cross-ties. Discussion, pp. 113-125.
- Track—See Construction.
- Transfers—1895, p. 55. By G. W. Baumhoff. Discussion.
- Transfers on Street Railways—1894, p. 143. By J. N. Beckley.
- Trucks, Street Railway—1896, p. 73. By J. N. Akarman
- Trucks, Street Railway, Traction and—1893, p. 129. Special paper by E. A. Sperry.



Ventilation, Lighting and Care of Cars—1885, p. 145. Discussion of this subject, also advertising, care of cars, care of horses.  
 Ventilation, Lighting and Care of Cars—1886, p. 60. By Walter A. Jones.  
 Wages—See Labor.

## CONVENTION BUILDING.

The Association has never been quartered as nicely as it will be this year; indeed, the question of a suitable place and adequate space for exhibits has become so much of a problem that it is one of the requisites in selecting the convention city. The earlier date this year—early September instead of late October,

termed, as it is practically all above the street level and well lighted by windows. The freight entrance is 17 ft. wide by 11 ft. 6 in. high.

There is an abundance of electric power at hand, plenty of light by day and night, and such exhibitors as are obliged to work all night installing will have no difficulty in doing so. As the building will be ready one week in advance of the opening day of the convention, there will be no excuse for delay in getting exhibits set up. The tracks of the Boston & Albany road extend to the building, which will greatly facilitate shipping in and out and save the usual loss of time and expense in cartage.

A new feature which will be highly appreciated will be the Bureau of Information on the main floor, where mail may be received and sent and telephone service found. A telegraph



THE CONVENTION BUILDING.

as heretofore—will insure delightful weather, and exhibitors will not feel the necessity of taking out extra life insurance before starting to install their displays.

The building selected is admirably adapted to the requirements, having been erected expressly for the annual industrial exposition of the Massachusetts Charitable Mechanic Association, where each October a notable exhibit lasting several weeks is made of the leading industrial products of New England. The building, which is at 99 to 149 Huntington avenue, is within walking distance of the Brunswick and Vendome and other hotels, and is reached by cars from all parts of the city.

The business sessions of both the American and Accountants' Associations will be on the second floor, reached by passing through the Exhibit Hall. The American Association will occupy the beautiful and commodious Paul Revere Hall, and the Accountants' Association will hold forth in the banquet room.

Exhibits will be better and more numerous than ever, and over 60,000 sq. ft. of space has been taken. When it is remembered that 40,000 sq. ft. was the most available heretofore, the magnitude of the display will be better realized. A classification has been made under which all cars, trucks and machinery in operation will go into the basement, which, however, should hardly be so

office will be in operation day and night; this is also on the main floor.

W. F. Pope is acting chairman for the Committee on Exhibits, Mr. Clark having gone abroad on account of ill-health.

## WHO WOULDN'T BE A SALESMAN?

"No, sir," exclaimed the irate manager, as a man entered the office with a queer looking model under his arm, "you can't sell this road a patent duplex, double back action, self dumping fender. We have experimented with 34,256 different fare registering contraptions, and have bought brakes enough to break the company. Of heating dingusses, why, good Lord, man, we have stoves that heat the Arctic region in the prospectuses, and freeze out everybody but the bondholders in practical use. Once for all, sir, we are not in the market, not even for a device that will light, collect fares, throw off drunken men, and keep flies off the motorman's nose." The irate manager then drew a long breath, slammed down his desk, and departed in high dudgeon, leaving the poor fender man speechless with astonishment.



The Street Railway Accountants' Association of America meets on the same dates and under the same roof as the American Street Railway Association, and with this gathering writes Vol. II, in the records of its interesting history. The business sessions will occur in the banquet hall of the Mechanic Association building, on the same floor and convenient to the meeting place of the American. Delegates are entitled to travel on the special railroad rates made the parent association, which are one and one-third regular fares for the round trip. Official headquarters will be at the Brunswick hotel near by.

The business sessions have been planned to conform as nearly as possible to those of the American Association, to enable members to join in the various trips of inspection of power plants, etc., and the entertainments, for which purpose the badges of the American Association will be furnished and worn. Accountants are urged to bring their ladies, for whom the local committee has provided a delightful program of entertainment.

The Association, which was organized in Cleveland, March 23 and 24, 1897, with 25 members, is growing rapidly in strength and influence and now numbers 67 members, including five in Canada and Mexico. Like the American, membership is vested in the companies, not individuals, although any member company may send as many representatives as it desires, and any company not a member is invited to send duly accredited representatives, who will be gladly welcomed. The scope and purpose of this Association is much better understood today than it was a year ago and is receiving the encouragement and hearty approval of the best managers and presidents in the country. The business-like and methodical manner in which the Association works, the energy and ability it displays, and the greatly to be desired results it is achieving make it deserving of the encouragement and support of every road in the land.

The officers, particularly the secretary, and the Permanent Committee, of which C. N. Duffy of St. Louis is chairman, have done a vast amount of hard work and have earned the thanks of every company and manager.

During the year the Association has lost by death three representatives:

Morris W. Hall, secretary of the Camden & Suburban road, Camden, N. J. Mr. Hall died after a prolonged illness. He was chairman of the organization meeting at Cleveland.

James A. Stratton, secretary and treasurer of the Birmingham Railway & Electric Company, Birmingham, Ala., died in February of this year.

Charles Blair Reavis, auditor and treasurer of the Augusta Railway & Electric Light Company, Augusta, Ga., died very suddenly on August 2, of Bright's disease. He took an active part in both the Cleveland and Niagara Falls meetings and was third vice-president last year.

The papers to be read will be excellent and the discussions following of interest and value; the two features, however, this year will be the exhibit of forms and blanks, and the report of the Permanent Committee on a Standard System of Accounts. The splendid work of the committee last year has been further supplemented and continued since last convention. The several members have devoted a great amount of personal time and effort to the perfection of what was so auspiciously inaugurated, and have spent an entire week in session in New York, beginning July 18. As a result of this work the committee will report in favor of changing the four general headings to three—Maintenance, Transportation and General. The accounts (39) under each general heading remain unchanged.

Accounts 8 and 9 were consolidated into one account. The cost of depreciation and renewals of horses was transferred from Account 8, "Renewals of Horse and Vehicle Equipment", to Account 31, "Stable Expenses". "Renewals of Vehicle Equipment" was consolidated with Account 9, "Maintenance of Miscellaneous Equipment", and in the consolidation of the two accounts Account 9 became Account 8. An account is provided for Legal Expenses in connection with damages and another account for other legal expenses, as recommended by the Niagara Convention. "Taxes" Account 39 is classed as an Operating Expense Account, so that Operating Expenses would mean all expenses except Interest.

The analysis of each account was carefully gone over and much improved, the aim of the committee being to make the analysis as plain and comprehensive as possible, and yet brief. An alphabetical index of items with the number of the account to which each should be charged has been prepared.

The form of Annual or Monthly Report was changed to conform with the new arrangement of "Taxes" as an Operating Expense, when it was formerly classed as a "Deduction from Income", the same as "Interest on Funded Debt", or "Rentals of Leased Lines", otherwise the form of Annual and Monthly Report was not changed, as the committee felt satisfied that it could not be improved upon.

The Executive Committee will hold its annual meeting in the Hotel Brunswick on Monday, September 5, at 7:30 p. m. The program for the rest of the week is as follows:

#### Tuesday, September 6.

10 a. m. (Mechanic Association Banquet Hall.)

Opening Business Session—Reports of officers. Appointment of committees, etc.

Paper—"Statistics; Their Use and Abuse," E. D. Hibbs, auditor North Jersey Street Railway Company, Jersey City, N. J.

#### Wednesday, September 7.

10 a. m. (Mechanic Association Banquet Hall.)

Paper—"Car Mileage; How Arrived At and Its Use," A. H. Ford, secretary and treasurer, New Orleans Traction Company, New Orleans, La.

Report of the Permanent Committee on "A Standard System of Street Railway Accounting, Covering the Classification of Operating Expenses, Classification of Construction and Equipment Accounts and Form of Annual Report."

Chairman—C. N. Duffy, secretary Citizens Railway Company, St. Louis, Mo. H. L. Wilson, auditor Boston Elevated Railway Company, Boston, Mass. Wm. F. Ham, secretary Nassau Electric Railroad Company, Brooklyn, N. Y. J. F. Calderwood, auditor Twin City Rapid Transit Company, Minneapolis, Minn. H. J. Davies, assistant secretary Cleveland Electric Railway Company, Cleveland, O.

#### Thursday, September 8.

10 a. m. (Mechanic Association Banquet Hall.)

Report of the Permanent Committee on "A Standard System of Street Railway Accounting"—Continued.

#### Friday, September 9.

10 a. m. (Mechanic Association Banquet Hall.)

Informal discussion of questions relating to Street Railway Accounting. Leader—R. Lancaster Williams, treasurer Richmond Traction Company, Richmond, Va.

Closing Business Session—Report of Convention committees.

Election of officers for 1898-1899.

All papers and reports are subject to the fullest discussion and ample time is allowed.

The Exhibition of Blanks and Forms will be in charge of the following committee:



Chairman—F. E. Smith, auditor Lynn & Boston Railroad, Lynn, Mass. G. E. Tripp, treasurer Lowell, Lawrence & Haverhill Street Railway, Lawrence, Mass. R. N. Wallis, treasurer Fitchburg & Leominster Street Railway, Fitchburg, Mass.

## OFFICERS.

President—H. L. Wilson, auditor Boston Elevated Railway Company, Boston, Mass.

First Vice-President—E. D. Hibbs, auditor North Jersey Street Railway Company, Jersey City, N. J.



E. D. HIBBS.



P. V. BURINGTON.



A. H. FORD.



J. M. SMITH.



H. L. WILSON.

Second Vice-President—P. V. Burington, secretary and auditor Columbus Street Railway Company, Columbus, Ohio.

Third Vice-President—A. H. Ford, secretary New Orleans Traction Company, Ltd., New Orleans, La.

Secretary and Treasurer—W. B. Brockway, auditor Toledo, Bowling Green & Fremont Railway Company, Toledo, Ohio.

The Executive Committee includes the officers and William F. Ham, secretary Nassau Electric Railroad Company, Brooklyn, N. Y.

H. J. Davies, assistant secretary Cleveland Electric Railway Company, Cleveland, Ohio.

F. R. Greene, secretary Chicago City Railway Company, Chicago, Ill.

J. M. Smith, comptroller Toronto Railway Company, Toronto, Ontario.

## SECRETARY BROCKWAY.

W. B. Brockway, who has so acceptably filled the laborious position of secretary of the Street Railway Accountant's Association since its organization, was born in Coldwater, Mich., but was reared in the east. He has had experience in all branches of railroading, having been engaged in such work for 13 years, 11 years of which were with steam roads and two with electric lines. He is now assistant secretary and auditor of the Toledo, Bowling Green & Fremont Railway. Mr. Brockway was married to Miss Elizabeth Priest in Toledo, October 10, 1894, and has one daughter.

The Concord (N. H.) Street Railway has joined the Accountants' Association, and Secretary Brockway has received promises from several other roads which will become members at the Boston meeting. The Association is gratuitously doing for its members a work which would cost any one road by itself several thousand dollars, and the very reasonable dues (only \$10 per year) give larger returns for the amount invested than any road can possibly obtain in any other way. While the papers will give a very complete report of the meeting, there is a great deal in the discussions which the Association reserves from general publication. All this, however, is printed in its annual report in book form, and these are numbered and registered and cannot be furnished to any but accredited members. Hence every road should join.



W. B. BROCKWAY.



W. F. HAM.



H. J. DAVIES.



FRANK R. GREENE.

## VINTAGE OF '98.

"We had an amusing experience years ago, in the old 'horse car days,'" remarked a superintendent who has seen more than a quarter of a century of active street railway service. "It was 'way back in the 70's. We had a sale of worn-out horses, which brought from \$5 to \$20 a head, and one of the fellows who bought a five-dollar steed afterward repented and claimed it had been misrepresented to him. As a matter of fact, there had been no representations of any kind. The horses were tagged with their selling price and turned into a pen for buyers to select from. The amount involved was too small to bother over and we would have refunded his money but for the abusive language in which he couched his demand.

"Well, he went away off to the farther end of town and entered suit in a little justice shop with the call set for 7:00 a. m. At the appointed time I was there and, as it happened, took three witnesses along, which, with myself, made four. He had two of his friends, neither of whom had been near the sale.

"The justice called 'time' and we went at it. The court didn't have a case very often and was bound to make the most of it. You would have thought five thousand dollars were involved instead of five; and the dignity of that court—well he belonged on the supreme bench, that's certain. One, two, three hours passed and we had used up more time than several such horses were worth. Our side said one thing and the other fellows as persistently and unanimously said it wasn't so. Finally the little old judge closed the arguments, summed up each side for us, and while gravely declaring that there evidently were at least three liars before him, and maybe four, whom properly he should fine for contempt of court and dissimulation, he concluded to decide in our favor as our witnesses were in the majority. And so the costs were a horse on the other fellow."

"The superintendent of an 8-mile road, who moreover was track foreman, tie inspector, chief and staff of overhead repairs, head armature winder and entire clerical force, had a weary look as he dropped into a chair after a hard day's work in handling the circus day crowd. He had the appearance of a man who was in doubt as to whether life was worth living or not.

"You are all played out," we remarked, "what you should do is to take a rest; go on a vacation, and stay away a month."

"Vacation! rest!! a month!!! Say, you don't seem to be acquainted around here. Been working this line for eight years, day in and day out, with nights and Sundays, until my children have grown up and hardly know me when we pass on the street. Last year I did think it was time to make a break, so I went to the president, who runs a bank, and suggested, as I had not had a day in seven years, and needed a change of air, that the company ought to give me a vacation."

"How long a vacation do you think you would require?"

"The way he said it induced me to reduce the request from the two weeks I had intended to ask for, to one. He thought it all over for a few minutes and then reluctantly said:

"Well, I guess you can have a week, but you better stay around where we can call you handy."

This superintendent had another of those hard-proposition small roads, where the directors are well up in farming and hardware and paper hanging, but what they have yet to learn about railroading would make several years' copy for the REVIEW.

The superintendent was a progressive, hard-working man well deserving a larger field of usefulness and who was making herculean efforts to keep the cars going and the road out of a receiver's hands. He was the whole executive and had it all to do. At last, by the closest economy and personal missionary work, he had reduced the expenses to a point beyond which it was impossible to go, and had increased the

earnings until the second dividend was actually paid. Then he concluded it was time to do something for himself, and at the annual meeting requested a small increase in his brief salary. The proposition was shocking to the astute board which thereupon went into executive session for two hours. At the end of that time the president gravely announced that in the judgment of the board the increase was not advisable but they had concluded to promote him and that his title thereafter would be "general manager."

"Yes, I've heard numerous stories about obstinate property owners who tried to stop the wheels of progress by threats, injunctions and standing in the trolley pole holes," said a determined-looking superintendent, "but did you ever try blowing them up with dynamite? Well, I did, and it works fine."

"You didn't actually kill them, did you?" asked one of the party.

"No, but we came within two inches of it. You see the line—it was a road down in New England—was surveyed for some two miles of the route along the beach road. On one side was the beach and on the other handsome residences and pretty lawns. Most of the people wanted the road and we had no trouble until we came in front of a place owned by a very wealthy and influential man. He said the road should never pass his door, and backed up his assertion with 200 pounds of Yankee determination. We said little but kept on until one day we reached him, and, as luck would have it, one of our heaviest blasts came right in front of his house. We managed to get the hole drilled and while we were ramming in the charge he rushed into the house and brought out a chair which he placed directly over the fuse. He declared we should never fire the charge without blowing him up too, and relied upon his well known social position to protect him. The boys looked scared, but there was no help for us so I gave the order and one of the men touched off the fuse. Then we all withdrew to a safe place and left him sitting there, bare-headed, in the hot sun. The perspiration began to ooze as he ordered us to come and put the fuse out. But we didn't, and as it slowly grew shorter and shorter I began calling out the number of minutes she still had to burn. The situation grew decidedly strained, neither side being willing to give in, but finally he looked down at the remaining two inches which began to sputter, and he suddenly changed his mind and, leaving the chair, made a wild rush. He just got out of range when the charge exploded, blowing the chair to bits and hurling rocks in all directions. That settled it and we won the day."

"That reminds me," said the man from Jersey, "of a somewhat similar case down our way a year ago. We were building an interurban and struck a tough proposition in the shape of an old Jersey farmer, who threatened to kill the whole construction gang before a single tie went down. He mounted guard from daylight to dark in his front yard and marched back and forth with a shot-gun which looked as big to us as a rapid fire gun on a man-of-war. We concluded to leave a gap there and went on and finished all the track but 200 feet. Then we came back and the old man was ready for us. The men refused to get in range, for the old fellow would draw a bead with both barrels cocked and moving his gun first one side and then the other, kept the road covered. After a consultation the foreman and I fixed it up for one of us to go in and engage the old man in conversation while the other made a detour and crept up in the rear. So we braced ourselves and under a white handkerchief as a flag of truce, and with no little trepidation I worked my way toward him. He kept pointing the gun at me and threatening to shoot if I came another step nearer, but the men were all looking on and I couldn't very well back out, much as I wanted to. I got up within 10 feet and finally engaged the old man in an argument, but he kept an eagle eye on the force and every time one moved he would take a bead on him. The foreman was all this time crawling up behind, and, after a few minutes which seemed like hours to me, suddenly jumped upon the

## PROMOTED HIM TO G. M.

hard-working man well deserving a larger field of usefulness and who was making herculean efforts to keep the cars going and the road out of a receiver's hands. He was the whole executive and had it all to do. At last, by the closest economy and personal missionary work, he had reduced the expenses to a point beyond which it was impossible to go, and had increased the





enemy and threw his arms around him. At the same instant I sprang forward and grabbing the barrel, pulled it from the stock. The old man saw the game was up and with a merry twinkle in his eyes said, 'Well, I'm beat, but I was mighty fearful it might go off and kill some on ye.' When we examined the gun both barrels were empty and it was so old and rickety it would have been as much as any one's life was worth to attempt to fire it."

Some one had mentioned pleasure resorts and big Sunday riding, when a superintendent from an eastern state smiled, and

**HOW HE KEPT SUNDAY.**

burned his thumb with a lighted match while he related an instance in his own experience. "It was several years ago," said he, "when the resort craze first

struck the roads, and we had for president one of our big stockholders, a man who was a great stickler for proprieties. In fact it was about all he could stand to see the cars run on Sunday at all, though he eased his conscience by riding on the line twice a day to church, although he lived only three blocks and the headway was so long he could have walked in one-fourth the time. When we talked park he took at once to the scheme, as a fine place for Sunday School picnics, and a sort of philanthropic breathing place for the man of daily toil. After the park was open he discovered that while the Sunday School picnics—what few there were—went on week days, the aforesaid man of daily toil and his numerous family persisted in staying away during the week, but turned out en masse Sunday, coming early in the morning, and bringing a lunch, and with the kids rolling on the grass under the trees until evening. The result was the line carried a big business Sundays and taxed our equipment to the limit. This was a poser. We couldn't abandon the line or the park either, for that matter; and the old man was full of grief at this desecration of the day. But when I made a deal with the city to furnish a free sacred concert every Sunday afternoon with a full brass band, the case became desperate. He called me in and wanted the concerts declared off, but I explained we couldn't very well back out, as the agreement was made in good faith, and besides the mayor, whose pet scheme the band concert was, did not love us any too well, anyway.

"Well, the president 'mulled' it over all the week and finally, at 5 p. m. Saturday, he came in smiling. He had got out of Egypt to the promised land, and announced he had brought in his resignation, which was neatly written out and duly filed with the secretary. And what do you think? Well, bright and early Monday morning he came in and withdrew his resignation. He kept this up for several weeks, resigning every Saturday night and withdrawing it early Mondays, so he managed to get over the Sabbath with a pretty clean conscience, while his wicked superintendent and the boys were working rush trips all day long.

"After a while one of the directors who didn't like the old man any too well, got on to his scheme, and they called a director's meeting for 11 p. m. Saturday night. The president was out

spending the evening and came home tired, and retired without reading his notice of the meeting. In fact he mislaid it without opening the envelope and forgot all about it. So when he sailed in Monday a. m. as usual and asked the secretary for his resignation, which by this time had become pretty nearly worn out, he was pleasantly informed the board had accepted it and he wasn't in it. Well he tried to make a row, but the story leaked out and his friends made so much fun of him he concluded to take a trip, and when he returned informed the board he guessed he had more work than was good for him and so resigned from the directory and stepped out."

**LAKE SHORE TRAIN SERVICE TO BOSTON.**

Those of our western readers who have ever journeyed over the famous Lake Shore and New York Central, will be likely to follow the same route in going to the Boston convention this year. These two systems, now practically one, are probably the best railroads in the world, and for delegates to Boston special provisions and concessions are made.

The rate of one and a third fare for the round trip has been secured, and these tickets will be good going on the "Limited" as well as other trains. Special sleepers have been reserved for the street railway people and will run through without any change from Chicago to Boston. The train carries all the modern conveniences of dining, observation and buffet, library and smoking cars. It leaves Chicago at 5:30 p. m. daily, and those leaving Sunday evening will be in Boston at 9 p. m. Monday evening.

A large delegation, however, will go on the "Boston Special," which leaves Chicago at 10:30 Sunday morning, reaching Boston at 3 p. m. Monday. This train will attach, at Cleveland, cars from St. Louis, and receive further additions from Ohio and Indiana points, Buffalo, Syracuse, Rochester and Albany. It will give a fine opportunity for renewing acquaintances and nothing will be wanting to make the trip enjoyable.

Reservations or further information can be had of F. M. Byron, General Western Agent, or H. J. Rhein, City Passenger Agent, 180 Clark street, Chicago.

**QUINCY, ILL., ROAD SOLD.**

The Quincy Horse Railway & Carrying Company, now operated electrically, has been sold to a party of capitalists from Portland, Me., who will soon elect a new board of directors and re-organize the company. Improvements will be made, and already an order has been placed for 12 double (No. 49 Westinghouse) motor equipments.

Knoxville, Tenn., is to tender a public reception to the Baltimore capitalists who recently organized the Knoxville Traction Company and consolidated the railway, electric light and power interests in that city.

### A PROMINENT STREET RAILWAY MAN.

Hon. Edward P. Shaw, treasurer and receiver-general of Massachusetts, has long been an enthusiastic advocate of electric interurban railways, and it is largely through his efforts that recent progress in this line in Eastern Massachusetts is due. The present development of electric railway interests in New England exceeds the most sanguine expectations of most men, but it is only the fulfillment of the predictions of Mr. Shaw.

Mr. Shaw has been and is now interested in a large number of interurban roads, and through the firm of J. F. Shaw & Co., of which he is a member, has helped to build many of them. During the past year this firm built the road connecting Fall River, Mass., and Newport, R. I.; that from Taunton, Mass., to Provi-



dence, and connecting with the Brockton, Bridgewater & Taunton, giving a 38-mile ride without change of cars; the Salem & Wakefield line, connecting Salem with Wakefield, for Lowell, Nashua, Boston, etc.; and the Southbridge, Marlborough and Framingham road, connecting at Marlborough with the Worcester & Marlborough (built last year) and making a through line from Framingham to Worcester.

At the present time one may take electric cars at Newburyport, Mass., and ride to Nashua, N. H., Boston, Brockton, Taunton, or to Providence, Fall River, Newport, R. I., New Bedford, or Nantasket Beach. In fact, one can ride a whole day on the electric cars in Massachusetts making but few changes.

Mr. Shaw says of the industry: "I know of nothing that gives anywhere near as much for the money spent as the electric railway gives its patrons."

### STERLING SUPPLY & MANUFACTURING COMPANY.

The Sterling Supply & Manufacturing Company, New York, of which J. H. Carson is the progressive head, has continued during the past year the same expansion in its business which made for it so notable a record in '97. In the various lines of registers, brakes, fenders, sand boxes and over-head material fully twice the amount of business has been done this year, that was done last season; and last year's business was a record breaker. The company's large and excellent manufacturing facilities and the high standard maintained in all of its products have held old customers for large renewal orders and secured many new ones.

Street railway and supplymen have been watching with interest and pride the gallant conduct of William Tiffany, secretary of the Sterling Company, in his experiences as a member of the Rough Riders. It has been a surprise to other countries that

young men of wealth and high social distinction like Mr. Tiffany, should exchange the pleasures and comfort of home and society for the dangers and privations of the soldier's life. Mr. Tiffany has been ill with fever and while at one time dangerously low with the fever, at this writing is making rapid progress toward recovery, for the early attainment of which all his many friends are hopeful.

### THE THORNDYKE, BOSTON: POPULAR EUROPEAN HOTEL.

There are always a large number of attendants upon the convention who find it much more convenient to use a European plan hotel, owing to the irregular hours and distant points at which they are obliged to dine. Those in charge of exhibits especially find difficulty in reaching their hotels during the usual meal hours, and the result has been they are compelled to pay twice for each meal. For those who desire the European plan The Thorndyke, conducted by G. A. and J. L. Damon, will be found to meet their wants admirably. Good rooms for one or two persons range from \$1.50 to \$2.00 per day up. The location is opposite the Park street depot of the Old Colony road, and within very convenient walking distance of the convention hall. Reservations for rooms may be made by letter or wire.

### QUICK CONSTRUCTION IN NEW YORK.

In reconstructing the lines of the Metropolitan Street Railway Company, of New York, for electric traction it has been the policy of the company to obstruct the streets for as short a time as possible. President Vreeland placed horse cars on the completed sections until the whole line was ready for the motor cars. As an example of rapid work the following results were accomplished after 13 days work on the Sixth and Eighth avenue sections: 10.2 miles of old track, 21,000 ties, 3,500 rails, and 3,600,000 cu. ft. of earth removed; 65,000 ft. of pipe and conductors replaced and 170,000 ft. of feeder duct laid. This was accomplished by 6,200 men with 400 carts and 550 horses.

### NEW SOUTHERN UNION STATION FOR BOSTON.

The Boston Terminal Company, under authority of an act passed by the Massachusetts legislature two years ago, is now building what will be the largest railway station ever constructed. The station has fronts on Dorchester avenue, Summer street and Cove street. It is to be used by all the roads entering the city from the south and southwest and also by a few branches found north of an east and west line through the city.

Together with the train shed the station will be 700 ft. long and 650 ft. wide, with 28 tracks. There will be, in addition to these, underground tracks for the suburban service.

### BUCKLING OF TRUSSES ON BROOKLYN BRIDGE.

On the evening of July 29, when traffic on the New York & Brooklyn Bridge was quite heavy a sick horse caused a blockade of the trolley line and a great many of the electric cars were brought to a stop on the bridge, and it is stated that the regulation as to a distance of 102 ft. between cars was entirely disregarded. Before the cars commenced running the four main trusses buckled slightly, without causing serious injury to the bridge, however, or making it dangerous for the cars.

It is believed that the stress imposed by reason of expansion because of the excessive heat had as much to do with the buckling of the trusses as the heavy loading.

The Camden (N. J.) & Suburban Railway Company is vigorously opposing the paving of six of the principal streets of Camden with sheet asphalt, and has so far been successful.



**BOSTON HUBLETS.**

When it was proposed, a few years ago, to lay a track across the sacred common, Rufus Choate thundered forth in the following words, now famous:

"Here you may go, when vernal breezes blow and drink in all the charms of reawaking nature, but grant the prayer of the petitioners and what will you have? The roar of the railroad train, the rattle of machinery. Vesuvius, Stromboli, Cotopaxi, hell itself, gentlemen."

The opening of the subway was felt by merchants on the street where formerly the cars travelled on the surface. Fewer

the feeble colony already stretching up the hill sides and over the plains."

Church and state were evidently on an harmonious footing in 1781, for in that year one of the churches borrowed the tub from the fire engine and brought it into the sanctuary to administer baptism by immersion.

The first printing press in America was set up at Cambridge in 1639 having been brought over from England and it was under the charge of the president for many years. The first thing printed upon it was the Freeman's Oath.



people on the street; less trade. On rainy days the subway is less patronized; the explanation being that people avoid walking in the wet to the entrances.

A local historian many years ago in recounting the transformation of the city in its early days writes:

"Twenty years after its settlement wonderful changes had occurred; tangled thickets had given place to pleasant streets, dark forests to smiling gardens, and barren wastes to fruitful fields. Log cabins and tents of cloth had been exchanged for large dwellings and convenient stores, some even of brick and tile and stone. Wharves stretched into the harbor, and ships of various nations rode at anchor in the bay. The little cluster of buildings closely nestled between the three hills covered with forts and batteries of cannon, like overtopping towers guarded

The first newspaper ever published on the American continent. "The Boston News Letter," issued on April 24, 1704, was printed at Harvard College.

The authorities of Denver, Colo., have abandoned all effort to force the street railway companies to obey a fender ordinance passed last fall, as they believe that it is unconstitutional.

"Trips by Trolley and A-Wheel Around Hartford" is the title of a booklet published by E. M. White and H. O. Warner. A map showing the system of the Hartford Street Railway Company and its connections is inserted. A historical sketch of the city is given and all the interesting points in and about the Connecticut capital are described and finely illustrated.





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#### CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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VJL. 8.

AUGUST 15, 1898

NO. 8

When the 56 officials who organized the American Street Railway Association met in Boston on December 12, 1882, the street railway business of that city, and all others in the country with the exception of one, was conducted with animal power or steam dummies. San Francisco had its cable system, and Chicago had set the date for the inauguration of its first cable line. Two-horse cars had found their way into the larger cities, but for the most part the monotonous tinkle of the bob tail car kept time to the jingle of the nickel as it wig-wagged down the several inclines to the bottom of the fare box. At each end of the car the tin lamps dropped oil upon the patient public which literally sat in darkness, and in the winter a cheap quality of hay formed a sort of mossy bog through which the passenger stumbled to a seat. About three miles an hour was the speed, and there was ample time to wait for the old lady a block away, and for good-byes and courteous salutations on boarding and leaving the car.

Little wonder that in those days people had time to live to a good old age, enjoying the living, and departing with the satisfaction of a life well spent.

\* \* \*

In those days there were numerous competing lines in every large city, and the rivalry for business and extensions was very active and in not a few instances quite bitter. One of the problems which confronted the proposed association was how to mix these antagonistic elements without an explosion. But it was done, and one of the features of the American Association, in which we all take great pride, is the unbroken harmony of feeling and action which has prevailed all through the years. Now and then a breeze has ruffled the waters, and once or twice the weather looked squally; but in every case the storm passed around, and the convention closed with a bright sunset and a rainbow on the disappearing clouds.

Few fully realize or appreciate the magnitude to which, from its modest beginning, the Association has attained. Its conventions rank among the few largest in the country, and its exposition of appliances far surpasses them all, and puts the American in first place. The expenditure in time and money on the part of exhibitors each year, easily represents the profits on over a quarter of a million dollars of sales, and has reached a point where no longer the street railway press need urge attendance and inspection by the visitors. Without this exhibit the annual gathering would be—well, to say the least, a very tame affair.

\* \* \*

The study of the Boston lines will afford an unusually fine opportunity, as the conditions of operation are in many respects to be found in no other city on this continent. The business streets, which were originally cow paths and short cuts, are both extremely narrow and tortuous in their wanderings. Indeed it is said a stranger has to exercise great care or he will meet himself coming around some one of the numerous contortions called thoroughfares. But with all the improvements Bostonians and all who love the dear old city—and who does not?—could wish, there is very much others might copy to advantage. The street railway problem has been one of the most difficult to solve, and could never have been satisfactorily worked out under the old condition of many companies. Consolidation of lines in Boston has been everything to the public, and has brought nothing but good results and improvement. The same is also true wherever consolidations have been effected.

\* \* \*

It does not seem possible that the transformation from the old horse car regime to the infinitely better in every way electric service could have been brought about in so short a time; and it at once reflects the enterprising character of the American manager to whom failure is an unknown quantity, and the inventive and engineering ability of those who have had to devise and build and supply. Both are typically characteristic of the genuine American spirit, and we may all take a just pride in the industry which enlists our thought and effort, and which calls us together once each year.

\* \* \*

The dozens of suburban lines which feed into the city and have thrown a veritable spider web of tracks over eastern Massachusetts will constitute one of the valuable subjects for study and inspection. The densely settled character of the country, with hundreds of villages and towns, each a link in the chain of industry connecting the larger cities, has made possible the successful operation of so many lines. The business of these towns is largely interdependent, and the thousands of workers in the factories who also use the trolley car when they ride on pleasure, constitute a patronage both large and steady and form a basis for the enormous business handled by these interurban roads. One may not only cover the larger part of eastern Massachusetts in an electric car, but cross the borders into Rhode Island, Connecticut, New Hampshire and Vermont. And new lines are being constantly added.

\* \* \*

We anticipate a large attendance from the west. Some have thought the distance would prevent a few from going, but the indications are that large delegations will attend. As a matter of fact he who misses one of these conventions has lost something he can never regain.

\* \* \*

Secretary Penington has wisely followed the precedent set last year, and held the program of papers down to seven reports. This gives abundant time for discussion which is even more valuable than the report itself as it gives the experiences of so many individuals. This discussion can also be further improved if delegates will make some preparation before leaving home in the way of looking up the actual figures, and come prepared to give their views in the fewest possible words. In this way a much larger number of speakers could be heard, and there would be less aimless wandering from the subject than has occurred at some meetings. As a rule the convention can learn more in a discussion where five men are heard in 10 minutes than where one occupies the same amount of time.



The two subjects which will probably enlist the most attention are the paper on single and double truck cars for city work, and that on pleasure resorts. The first is decidedly a mooted question, and a great diversity of opinion exists. Many excellent managers have thus far been really unable to make a satisfactory decision. As to pleasure resorts, some roads have made a fine success, while others have as miserably failed. It would seem that we now have spent sufficient time and made enough experiments to be able to recognize those conditions which warrant the operation of a resort, and the forms of amusements which can be successfully used. In other words, what is good in one instance has failed in another; and it is evident that the widely varying local conditions must form the basis of decision. At the same time we ought now to be able to make an intelligent diagnosis of each case and to compound the proper remedy.

Will the time ever come when women conductors and motor-women will be employed to any general extent? A year or two ago there would have been no uncertain sound in the negative reply which would have been given. The very fact that there is any doubt as to the future in this respect, is an evidence that it yet may be. We have all heard for years of the young lady conductors and their acceptable work, on the street cars in Chili, and other South American lines; and we surely dare not entertain the thought that American girls are in any way inferior to their sisters of the far south. The range of woman's work, or rather the work performed by women, has broadened so greatly and rapidly during the past 10 years that the doors of few educational institutions are longer closed to her, and she has established a place for herself in almost every avenue of business, trade and industry. With all her ability, and with every motive of generous recognition of ability she has already earned or may deserve, we cannot but feel that woman's greatest work is, or should be found in the home, and not in supplanting those who are the natural providers and heads of families. Two small roads in Ohio have already placed women on the rear platform, and the experiment of teaching another to handle the controller and brake on an eastern road a few months ago demonstrated, at least in her individual case, the requisite ability and physical strength to perform the task equally as well as is being done by men.

It would seem that the future decision will rest largely upon the male employes themselves, and if the change is brought about it will probably be through their own acts of conduct and in attempts to do the work for which the company has already hired a manager.

The war is ended, and the country, proud of the unparalleled work of its navy and of the splendid achievements of the land forces, will now devote itself with undistracted vigor to the various occupations of peace.

If we except the loss of life, for which no gain can ever compensate, the results of the conflict cannot but be in the highest degree beneficial to the nation. The world has had the scales removed from its eyes, and Americans, and American shipping, and American products will be recognized every where as belonging to the first class. Our navy will, it is hoped, speedily be increased so that in point of size it will be in keeping with its quality, and with the magnitude and dignity of the country; our standing army will probably not be less than 100,000 men; and we shall be better prepared for action, which is ever the greatest safeguard against international difficulties.

The performance of American built vessels, and all the manifold machinery necessary to their successful manipulation has so clearly demonstrated the quality of American engineering products, that the markets of the world will welcome our industrial products of every kind, with the same high regard with which they have long accepted our meat and grain. As never before, it can be said, "The world is ours." Already American money and brains are putting in motion the wheels of foreign trade of which they little dreamed six months ago, and in proportion as we push our manufactured products to the attention and adoption of new markets will our prosperity broaden and increase.

A few months ago, it was an honest question as to whether Boston would be a suitable place for our convention. (This was in ante-Dewey days.) Now we gather with the clouds of war disappearing, and with all the bright prospects of peace and such a renewal of industrial activity in sight as has not been ours in several years. Capital which was still timid at the close of the years of depression, and again driven into hiding by the war, has seen it come and go without an opportunity to make fortunes in a day, and will now soon be competing with itself for choice lines of investment; and with an abundant offering of money as is sure to be, interest rates will fall, and new enterprises will be able to secure funds and come into actual existence. Among such will be a large number of street railway operations, and every indication now points to such a deluge of orders as will fill up the street railway supply concerns to the limit. We predict delay in securing cars and all the construction accessories for those who are forced to wait and place their orders after the first of the year.

The events which have occurred since our last gathering are written on the brightest pages of the history of our country or the world; and those deeds of valor have quickened the whole nation and make us proud as never before to claim that title, greater than any royalty can boast, "I am an American."

On another page will be found a letter from President W. B. Rockwell, of the Staten Island Midland Railroad Company, giving the details of an attempt to defraud his road by August Krause, alias John Schaeffer, and stating that by reason of having seen the man's portrait in the REVIEW he was enabled to detect the fraud. The method pursued by Krause is to loosen the screws fastening one of the grab handles to a car and then make it pull loose when he attempts to leave the car, thereby causing alleged severe injuries to himself. He has now been detected in this four times: September 28, 1895, in St. Paul, Minn., as John Cramer; March 25, 1897, in Canton, O., as John Miller; August, 1897, at Joliet, Ill., as August Krause; July, 1898, on Staten Island, N. Y., as John Schaeffer.

Quite recently three other swindlers who have successfully defrauded insurance and transportation companies have been detected, and the details of their methods will also be found in this issue. There is a lesson for all companies to be found in the history of Rice, the last of this trio. His method was to present claims whenever possible but withdraw them if he could not effect settlements promptly. The natural disposition of the average manager is to let a case of this kind drop if his own company is saved from loss, instead of investigating it and bringing the culprit to justice. By reason of this too lenient policy Rice has been enabled to attempt the same scheme no less than 40 times.

The description of the generating machinery and the distribution lines of the Chicago & Milwaukee Electric Railway will be of interest to electricians and street railway men in general. It represents a radical departure in interurban practice, and, if as successful as expected, will be the prototype of many other lines. The transmission of alternating currents at 5,500 volts effects an enormous saving in copper. In the absence of the many large feeder lines the exterior of this power station presents a peculiar view. Three wires about the size of those on telegraph lines conduct the current for the sub-stations. The installation of storage batteries at the sub-stations gives an economic load for the rotary converters which is highly desirable in alternating current operation. The arrangement for having transformers and a rotary converter mounted on a truck to be substituted for any injured sub-station apparatus renders unnecessary the duplication of the machines. Although there are a number of electric railways receiving power from high voltage alternating current transmission this is the pioneer road for which the current for transmission is generated in a central steam plant and carried at a high voltage to sub-stations placed at suitable points along the route. Much credit is due the promoters and engineers of the company for carrying out this bold plan which if successful will be of inestimable value in furnishing data for projected interurbans of great length.

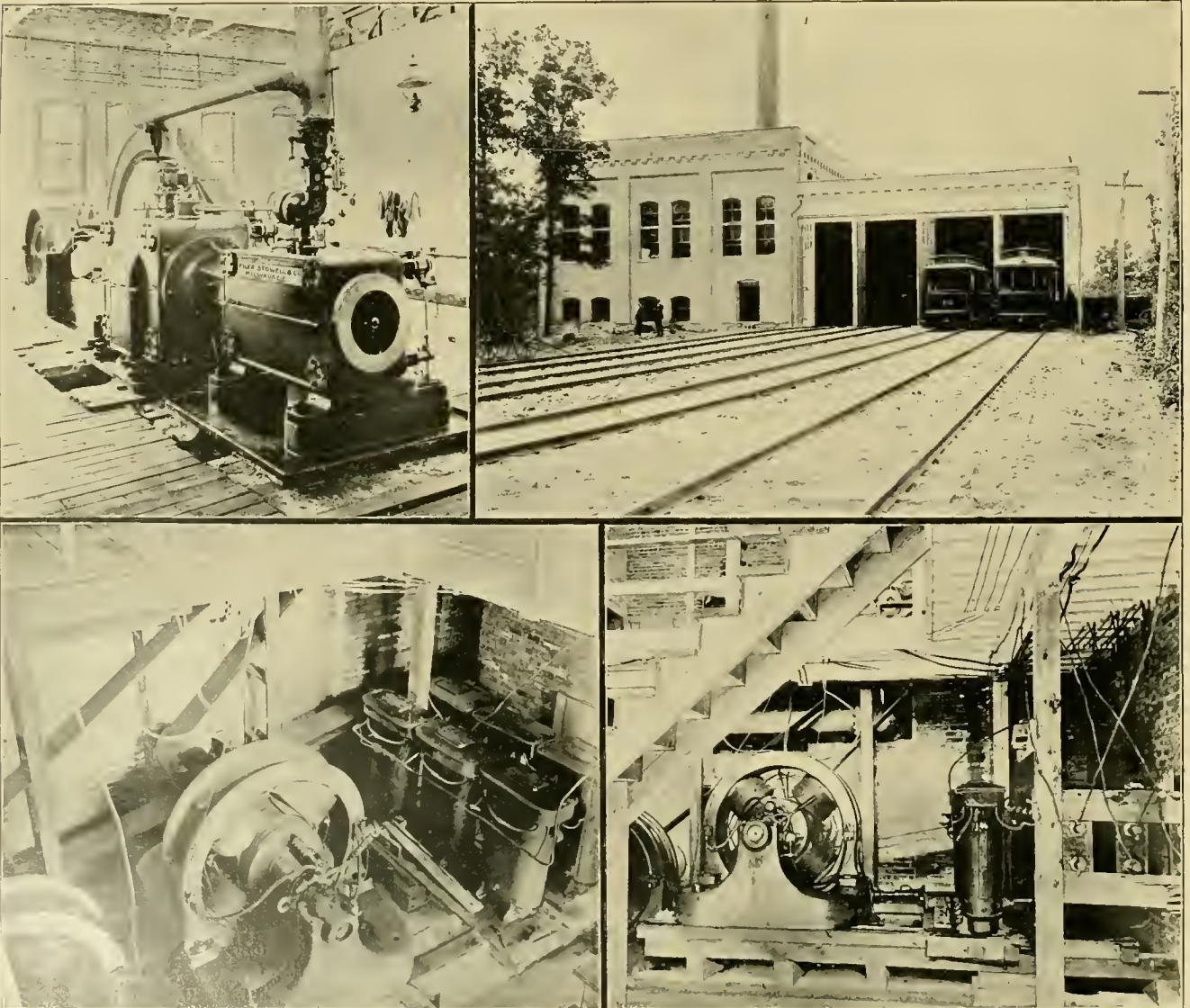
## THE CHICAGO & MILWAUKEE ELECTRIC RAILWAY.

On July 1 a portion of the Chicago & Milwaukee Electric Railway was put in operation. Although this line is not yet complete and is now being operated by means of a temporary electrical equipment in the power house, it is thought that the plans for the complete installation, which have been developed by Bion J. Arnold, the consulting engineer for the company, represent such a radical departure from ordinary electric railway engineering practice as to justify a brief description at this time.

The line may be called an interurban road. It runs through the chain of Chicago's most beautiful suburban districts lying along the shore of Lake Michigan between Evanston and Waukegan, east of the tracks of the Chicago & Northwestern Railway Company. When the road is completed it will be hard to imagine a more delightful ride than it will offer. Beautiful suburban and country homes are scattered all along the way. The southern portion of the road, which is not yet completed is to unite the suburban towns of Evanston, North Evanston, Wilmette, Kenilworth, Winnetka, Lakeside, Glencoe, Ravinia and Highland Park. The road is now completed and in operation from the northern limits of Waukegan to the southern limits of

Highland Park, a distance of 18 miles. The government reservation at Fort Sheridan, the university at Lake Forest, the camping grounds at Lake Bluff, the manufacturing districts at North Chicago and Waukegan, and the beautiful bluffs and ravines all along the route lend interest to this portion of the road. The route is thirty miles in length and parallels for the entire distance the Chicago & Northwestern Railway. The name of the road would seem to indicate that it might eventually connect Chicago with Milwaukee.

In the building of this line the engineer was confronted with the same problems that are usually connected with the installation and operation of a high-speed, long-distance suburban electric road. The burdensome investment in copper feeders which would have been necessary to operate the road by means of one direct current station situated at the center of the line made this system prohibitive. The inefficiency in operation of two power stations for a road of this size or of a booster system operated from one power house was recognized. What was wanted was a system of generation and distribution which would represent a minimum amount of first investment, which would be capable of being added to as the load increases in a manner consistent with the original installation, which would operate with a fair degree of economy from the start, and at the same time be capable of the highest operative efficiency when eventually completed.



MAIN POWER STATION C. & M. RY., SHOWING TEMPORARY INSTALLATION OF TRANSFORMERS AND ROTARY CONVERTERS.



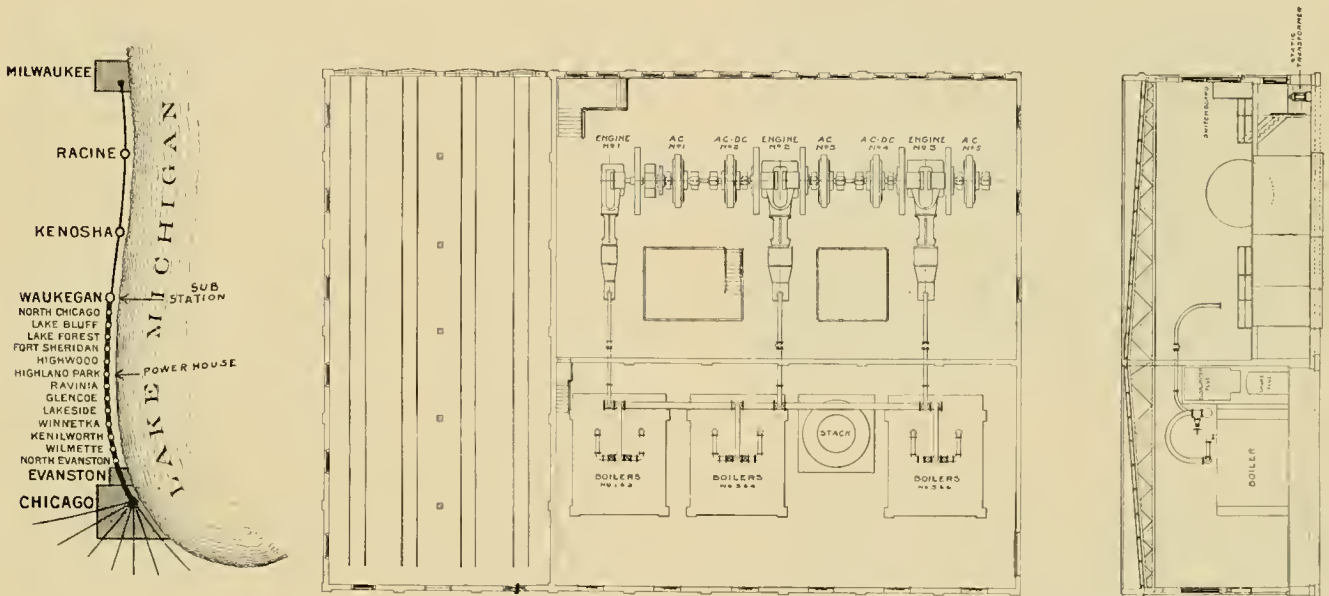
The plan which was adopted and which was thought to combine all these advantages consists of a combination direct current and three-phase alternating current distribution system with a generating station placed at the center of the line. The sections of the road adjacent to the power station are supplied with direct current from the power house itself. Sections of the line at a distance from the power house get their supply of current from sub-stations. These sub-stations each contain a rotary converter, consisting of a three-phase alternating current motor and a direct current generator combined in one machine. The sub-station motors are supplied with power over a high tension transmission line consisting of three small copper wires extending back to the power house. The direct current from each sub-station is distributed to the trolley by means of the usual system of feeders extending in both directions. The location of these sub-stations and their distance apart is governed by the conditions of traffic and somewhat by the nature of the grades along the line. There is no reason why a road 100 miles in length should not be operated by this scheme from one power house located either at the center of the gravity of the system or upon a site possessing peculiar advantages of rail and water

The line is at present operated as a single track road, except in Highland Park where a double track is laid and a block signal system has been adopted to insure safety in operation. Of the 14 cars now operated, ten are new 32-ft. cars, and four regular city railway cars built by the J. G. Brill Company, of Philadelphia. Two fine standard interurban railway passenger coaches, and two combination passenger and baggage coaches each 44 ft. long, with two 50-h. p. motor equipments mounted on the Peckham double standard railway truck are now building.

These cars are expected to maintain an average speed of 25 miles an hour. The fares charged are about one-half the rates upon the Chicago & Northwestern for the same distances.

The plan of the power station is shown in the illustration.

The boilers are of the Cahall-Babcock & Wilcox type, made by Aultman & Taylor. Each boiler has a rated capacity of 250 h. p., and they are set in batteries of two each in such a manner as to be entirely independent of the brickwork. The boilers are thus free to contract or expand, and the brickwork may be entirely removed and replaced if required without disturbing the boilers or connections.



MAP OF LINE AND PLAN OF MAIN POWER STATION.

facilities. The small investment required for copper will appeal to the investor, while the possibilities of economies of fuel and labor due to the concentration of the power generating apparatus into one station makes the proposition an equally promising one to the engineer. The development of this road and the economic results of its operation will therefore be awaited with considerable interest.

As shown upon the map, the power station is located at Highwood and the sub-station for the operation of the northern portion of the road is situated near the southern limits of North Chicago. Connecting the power house with the sub-station is an eight mile, 5,500 volt, three-phase transmission line of three No. 8 wires. From the sub-station the No. 00 trolley wire is reinforced by a No. 0000 feeder extending four miles south and a No. 000 feeder extending 3½ miles north. The subway, near the sub-station by means of which the electric cars pass under the Northwestern tracks, is an interesting piece of engineering not yet completed.

In the construction of the track 65-lb. T-rail and 75-lb. girder Johnson rails all in 60-ft. lengths are used. The overhead work is of the side pole method of construction in the outlying districts, with center iron poles through the business district of each suburb. The high voltage line wires are supported on glass insulators carried on wooden cross-arms on the side poles. Each pole is painted, while those carrying the alternating current lines have a danger notice stenciled upon them.

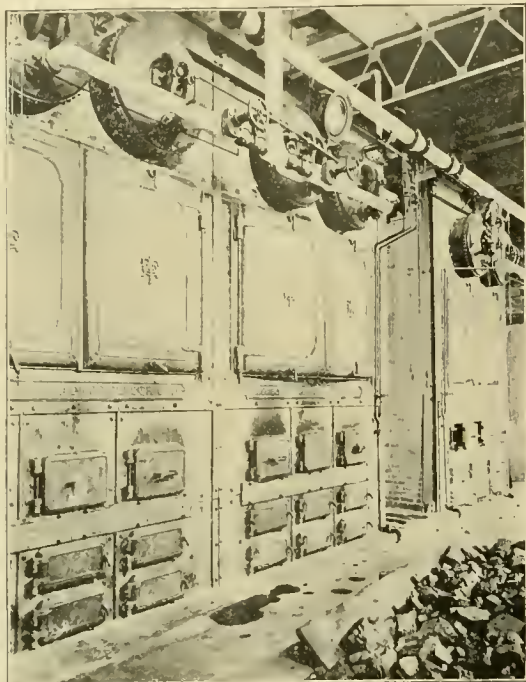
A steel stack of sufficient capacity to handle the escaping gases from eight boilers is to be placed so as to be flanked on either side by four boilers. Three of these boilers are now installed. Fuel economizers will be placed at the back of each battery of boilers, with the by-pass flue beneath. Streater slack coal is used and is delivered in front of the boilers directly from the cars. The furnaces are of the down-draft type. The supply of feed water is taken at present from the city mains, and is fed to the boilers by means of the Q & C system of boiler feeding.

The engines of the plant are of the horizontal tandem compound Corliss type, and run at 125 r. p. m. The cylinder dimensions of the one at present installed are 17 and 30 by 36 in. This engine was made by the Filer & Stowell Company of Milwaukee, and is rated at 400 h. p. The fly-wheel weighs 40,000 lbs. and is 14 ft. in diameter. The governor of the engine is of the Provell inverted type and is fitted with automatic safety stops to prevent the engine running away. This stop blocks the governor balls up except in the event of the governor belt breaking. The device is arranged so as not to need handling at the starting or stopping of the engine.

The present engine is of the side crank type. Future additions of engine units will be of the center crank type and will also be of double the rated power of the first unit. Each engine is also designed in all its parts so as to be capable of standing an overload of 100 per cent. This provision is made for emergency service, when the engines can be made to develop a power great-

ly in excess of their rating by admitting high pressure steam into the receiver through a reducing valve.

The unique feature of the power station, however, is the electrical equipment. Two different types of generators are employed: Generator No. 1, which is installed next to the engine No. 1, is an alternating three-phase G. E. machine. It has a capacity of 250 k. w. at 125 r. p. m. This generator has 24 poles, and, therefore, delivers a three-phase current of 25 cycles per second.



BOILER ROOM, C. & M. RY.

This current is generated at a potential of 5,500 volts, ready to be delivered directly to the transmission lines without the use of transformers. Generator No. 2 is a combination generator. It is also of 250 k. w. capacity, and runs at 125 r. p. m. It can deliver its out-put either as direct or as three-phase current. It has but one armature, but the windings of this armature are connected on one side to a commutator and on the other side to collector rings. The potential of the direct current end is 600 volts while the three-phase current is delivered at a voltage of 380. The generator can deliver an out-put up to its rated capacity of 250 k. w. from either the commutator or the collector rings. It can thus be used to supply current directly to the trolley passing in front of the power station, or can be used to operate the motors in the sub-stations, or for both purposes at the same time, dividing the load in proportion to the demand. It will be noticed that generator No. 2 is of considerable lower voltage than generator No. 1. When the three-phase current from this generator is transmitted to the substation it is necessary to raise its potential from 380 volts to 5,500 volts. This is accomplished by means of static transformers placed in the basement as shown. These transformers are cooled by a blast fan operated by a 1-h. p. induction motor. Generator No. 3 is to be a duplicate of generator No. 1.

The engines and generators are connected by means of the "Arnold system," which has been adopted by so many power stations that the details of the connections it involves have become familiar. Each generator is mounted on a quill or hollow shaft; suitable couplings connect this solid shaft with either the engine shafts or the generator quills in such a manner that each generator can be operated by more than one engine. Thus, engine No. 1 can run either or both generators No. 1 and No. 2, while engine No. 2 can be used to drive four generators when they are eventually installed. In case of a break-down of any engine, the other engines in the plant can be made to carry an in-

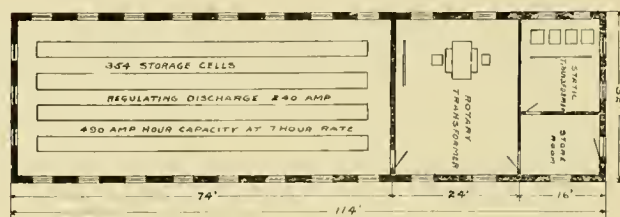
crease of load by the method already described. This system, then, insures the same reliability that is usually secured by investing in a reserve unit, but by means of a much less original investment. This system is also particularly adapted to a station of this character, containing, as it does, two different types of generators. When the load is light the road may be operated from one alternating direct current generator, and this is always available from two engines.

As the demand for the current varies the load may be transferred from one engine to another, or all engines may be operated in unison, which is important when working alternating generators in parallel. As each generator is mounted on independent bearings, it is possible, if occasion should arise, to operate generator No. 2 as a rotary converter, or even to connect generators No. 1 and 2 so that they could be used in the same manner.

In case of a break-down of one engine this generator may be connected to the other engine. To secure this same reliability with the ordinary direct connected independent unit station, another engine and generator unit would have been necessary, as in such a plant an accident to an engine cripples the entire unit.

The plan for the sub-stations is shown in one of the illustrations. These sub-stations are to contain the static step-down transformers, the rotary converter and a storage battery. It will be noticed that the electrical equipment of the sub-station is not in duplicate. This has been considered unnecessary as it is intended to mount the machinery needed for a sub-station, static step-down transformers and one rotary converter, upon a truck fitted with motors. In case of break-down at any sub-station the battery can be relied on to supply current for several hours, during which time the portable reserve sub-station equipment can be taken to the crippled station and be connected ready to operate until the repairs have been made.

The storage battery in a sub-station of this character has many advantages. It supplies all the sudden and excessive demands for current, due to the fluctuating load, peculiar to a road of this kind, operating few and heavy trains. The rotary converter can be made to carry a fairly average load, and in turn the generating machinery at the power house can be operated under constant conditions. This feature of steady load cannot fail to contribute to the fuel economy of the generating station. As the station is relieved of the necessity of supplying the occasional maximum load by the ability of the sub-station batteries to respond for short periods to an excessive demand, machinery of much less capacity is required in the power house than if the batteries were not used. A correspondingly reduced investment is required in transmission lines and rotary converters. To these



PLAN OF SUB-STATION.

advantages may be added one more, which is peculiar to the alternating-direct current system of distribution. The effect of the self induction of the alternating current motors in the sub-stations compels consideration of "leading" and "lagging" currents, which may become extremely troublesome. The best condition for operation is when the power factor of the circuit is unity; that is when the apparent energy is equal to the real energy. The strength of the motor field can be adjusted at any given load so as to neutralize the inductance of the line, and leave the current nearly in phase with the e. m. f. If the motor can operate at or near this given load, the power factor will not depart far from unity, and the circuit will act like a continuous current line. If the load varies, however, to any great



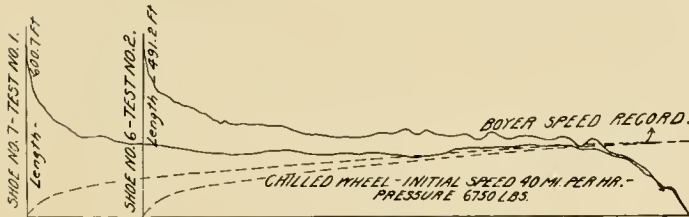
extent, the resulting "false current" may compel the transmission over the lines of a current greater than that really required to operate the motor. The storage battery, by furnishing a reservoir to which energy may be given or from which energy may be taken as the load varies, enables the rotary converter to carry a practically steady load, and thus the accumulator contributes much toward maintaining an electrical balance in the alternating current circuits. As the road is extended and the traffic becomes heavier, the conditions of the service will probably make the installation of a battery at the main power house a desirable investment.

The original projectors of this line were C. E. Loss & Co. who were also the contractors and builders. The Chicago & Milwaukee Electric Railway Company was organized to purchase and operate this property. The officers are as follows: G. A. Ball, president; A. C. Frost, vice-president and treasurer; Geo. M. Seward, secretary and auditor, and R. S. Ives, general superintendent.

A WORD ABOUT BRAKE SHOES.

A safe, quick acting and effective braking apparatus is an absolute necessity for urban street cars because they operate in crowded streets where inability to stop quickly will often be followed by a number of damage suits. It is equally a necessity on interurban electric lines, though there may be less danger of collision, because the higher speed demands a better brake. Every element of the braking mechanism is important and the last element, the brake shoe, is just as important as the others, though it has been to a great extent overlooked. If the shoes wear quickly, the cost of shoes is high; if they are hard they cut the wheel, and wheels cost more to replace than brake shoes; if the wheel is locked it makes a flat spot and must go to the shop to be reground.

An ideal brake shoe would therefore have a high coefficient of friction to give a quick stop; must not cut the wheel; should not wear rapidly, to keep down the cost; it must not block the wheels; and, above all, it should be safe. The American Brake Shoe Company is now introducing to the street railway trade the "Diamond S" brake shoe, which has these desirable qualities. It is made by pouring cast iron about a bundle of expanded soft steel strips, which combination gives a shoe eminently strong and safe. The questions of friction and wheel locking appear to be settled by the tests of these shoes made on the M. C. B. brake shoe testing machine by the engineer who made a majority of the M. C. B. tests. The accompanying diagram is from his report and compares a cast iron shoe (No. 7) with a "Diamond S"



GRAPHICAL COMPARISON OF STOPS.

shoe (No. 6) under similar conditions. It will be remarked that the "Diamond S" shoe gave a stop 18 per cent shorter, and what is most important, the pressure tending to lock the wheel (shown by the height of the diagram) is no greater towards the end of the stop than for the plain cast iron shoe.

As to the wearing qualities, we are advised by the Chicago General Railway Company that the average life of a plain cast iron shoe under its cars is 17 days and that of the "Diamond S" 75 days.

The "Buffalo Courier" reports a collision between a bicycle and an electric car moving at high speed. Both the rider and wheel were picked up by the fender; the wheel was knocked off after 40 or 50 feet, but the rider who was carried until the car stopped was uninjured.

ELECTRICITY ON THE MIAMI & OHIO CANAL.

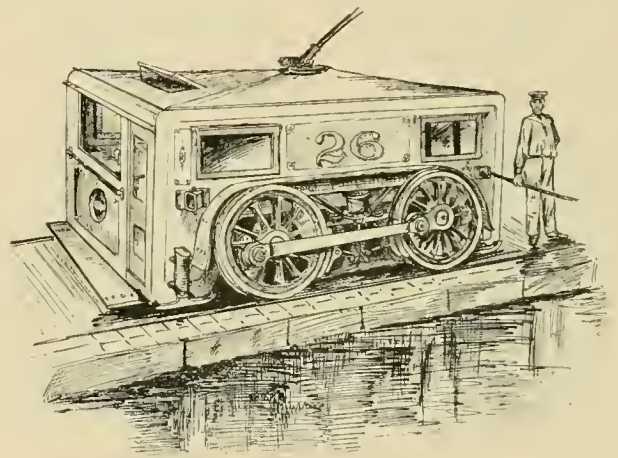
In accordance with an act passed at the last session of the Ohio legislature, W. G. Wagenhals, who was until very recently general manager of Cincinnati & Miami Valley Traction Company, operating an electric line between Dayton and Hamilton, has been granted the privilege of experimenting with electric traction on the Miami & Erie Canal. If the experiments are successful, Mr. Wagenhals is to receive the exclusive right to operate boats by electric power for 25 years.



Mr. Wagenhals saw the opportunity to make this application of electric power when he went to Dayton, two years ago, and made some preliminary trials which convinced him of the practicability of the plan. An ordinary motor car towed two boats loaded with 80 tons each at a speed of 10 miles per hour, with an expenditure of 20 amperes. This proved to be too high a speed as a wave 3 ft. high was thrown ahead of the boats and forced the water over the banks. Six miles per hour was entirely practicable, however.

The canal is 250 miles long, connecting Lake Erie with the Ohio, and was built at a cost to the state of \$8,002,680; it is 60 ft. wide and 4 ft. deep. The map shows the cities and towns which it connects. This work has been falling into decay, because the towing by mules is too slow and costly; efforts to use steam have failed because the propellers did not give satisfaction in such shallow water.

The illustration shows the latest design of motor for this work: it is to weigh 20 tons and is 6 ft. over all. Where the tow-path



ELECTRIC LOCOMOTIVE FOR CANAL TRACTION.

runs under lift bridges the current will have to be taken from a conduit as there is not head room for a trolley line.

Mr. Wagenhals presents these figures regarding the investment: "Taking 1886 as an ordinary year the state statistics show gross earnings of over \$190,000 between Dayton and Cincinnati alone. With electric power it can be operated for one-half this amount, leaving \$95,000 for the interest on an investment of \$850,000 which it would require to equip the canal between Dayton and Cincinnati. If this amount was earned with mule power and a small number of boats, good service and good management will surely greatly increase the business."

The success which attended Mr. Wagenhals' administration of the roads with which he has been connected, is a guarantee that this enterprise will also succeed.

### FORGED STEEL SPLIT AXLE GEARS.

The Duquesne Forge Company, of Pittsburg, Pa., is now making under patents a forged split axle gear, illustrated herewith, in which the tire or flange is a rolled steel channel section. The channels are rolled from large ingots which makes a homogeneous, well-worked product free from blow-holes and imperfections. It is stated that these wheels compete in price with the best steel castings.

Fig. 1 shows a cross section of the steel channel bar and one of the channels as it comes from the dies bent to the desired curvature. Fig. 2 shows the steel cross arms; attention is called to the cut showing the arm bent under the hammer. Such a test is convincing that any possibility of breaking arms which will submit to such a test has been removed. Fig. 3 shows the combination of tire and cross arm. These cross arms are placed in position after the tire comes from the dies. They are forced into position and permanently set at the hammer; when the forging cools these cross arms are practically iron and iron at the joints and held so tightly in position that they can only be removed by reheating the tires. These sections are next taken to machines and faced off, after which they are placed in special machines where each section is bored and countersunk, after which bars of  $\frac{3}{4}$  in. cold rolled steel are driven through them and headed up as shown; the joint thus secured first by shrinking the cross



FIG. 1—STEEL CHANNEL BAR.

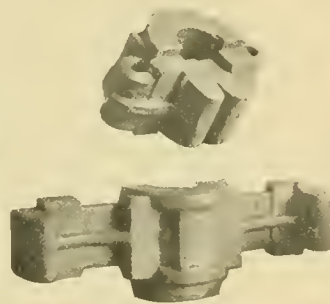


FIG. 2—STEEL CROSS ARMS.



FIG. 3—CROSS ARM AND TIRE.

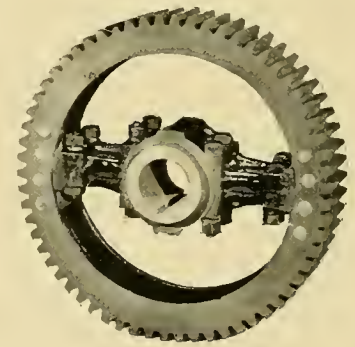


FIG. 4—WHEEL COMPLETE.

arms into the tires and second by these finished rivets driven cold with a strong driving fit, makes a joint which is solid beyond question and which cannot be disturbed in service. These joints have been submitted to the most severe tests under heavy hammers without disturbing them and wheels which have been in operation for 15 months are as tight as when first put on the car. Fig. 4 shows the wheel complete and ready for service. The manufacturers of these wheels claim many advantages for them, the chief of which are the following:

The wheels are stronger and 15 to 20 per cent lighter than corresponding cast wheels. Owing to the manner in which they are made it is impossible to have defects in the tires which are uniform in quality whether furnished in large or small lots and will wear evenly. The absence of the two extra spokes, present in all cast wheels, is more than compensated for in the additional strength gained in this wheel by its depth of flanges in the tire section. The absence of the spokes allows greater freedom in use of the wrench in adjusting the wheels on the axles.

The first wheels put in service, after more than a year's steady running, show scarcely any wear and tear; the manufacturers confidently expect that the wearing qualities will prove superior to the best casting that can be made on account of the ability to secure the same uniform quality of material in the teeth at all times.

Huntington, L. L., exhibited its appreciation of the introduction of the trolley car by a parade and demonstration, and the electric cars were operated free of charge all the first day. The trolley line supersedes a horse car road and charges a fare of 5 cents to the Long Island depot instead of 15 cents, the rate on the horse cars.

### NEW ROAD FROM BUFFALO TO THE FALLS.

The Buffalo, Tonawanda & Niagara Falls Electric Railroad Company on Saturday, July 16, opened for traffic a new extension of its lines. This new line begins at the corner of Tonawanda and O'Neil streets on the northerly limits of the city of Buffalo and follows O'Neil street to Niagara street, thence along Niagara street about one mile to a ferry on Niagara river, which runs between the terminal of this new extension and various resorts on Grand Island. This line will be farther extended along Niagara street to the village of Tonawanda and will prove to be a very popular electric line between Buffalo and Niagara Falls, as it follows the high banks of the Niagara river the entire distance in full view of the beautiful scenery of that river and Grand Island. Henry B. Smith, of Bay City, Mich., is the principal stockholder in this company.

### COMMUTATOR BUILDING.

One of the many new industries to which electricity has given birth is that of commutator building. The many thousands of electric motor cars in use together with the still greater number of public and private lighting and power plants have made of

commutator building and repairing an important industry. One of the oldest established and widely known firms in this field is F. E. Homer & Co., Cleveland, O.

Their care in construction, and the use of only the best raw materials has earned for the firm a most enviable reputation. Their customers are widely distributed and numerous, and they have many testimonials to the wearing qualities of their commutators. They report prospects as being good for a brisk fall business, and the number of orders booked for new commutators so far, as being far in excess of any previous record for the same month.

### CENTRAL UNION BRASS MATERIALS.

The Central Union Brass Company, of St. Louis, has met with most gratifying success in the sale of its goods for electric railways. The "Gem" line material made by it has proved to be very popular, as is not surprising, since it was designed by the company's electrical engineer who designed the emergency trolley clamp, adopted by many roads as standard. Wood's lightning arrester is one of its new products now being put on the market; it is simple in construction and has successfully stood the most severe tests applied to it.

The company desires all interested in its goods to have its latest catalogs and will be glad to send them on application. The W. R. Garton Company is the Chicago agent for the Central Union Brass Company.

The West End Traction Company, Pittsburg, has completed its new power station at the Point; there are two 1,000-h. p. Westinghouse generators.



**DEATH OF ADOLPH SUTRO.**

Adolph Sutro, ex-mayor of San Francisco and principal stockholder of the Sutro Railroad Company, died on August 8, at the age of 68 years. His life has been a most eventful and picturesque one. His father's wealth being destroyed in the German revolution of 1848, the young man left his home to seek a fortune in the new world. He was educated for an engineer and went to California to engage in mining. For nine years his labors brought little return, but after he planned the famous Sutro tunnel for the Comstock lode in Nevada and carried it to



ADOLPH SUTRO.

a successful completion he became immensely rich. Much of his wealth was invested in property in San Francisco and he became the greatest land owner in the city. He was philanthropist by instinct and many benefactions stand as monuments to his generosity. The Cliff House, the Sutro baths, the finest in the world, the children's play grounds near Golden Gate Park and the Sutro Historical Library have all been given to the city by him. In 1894 he was chosen mayor on the populist ticket. In order to provide additional transportation facilities to the Sutro Heights he built and operated the Sutro Railroad.

**REMARKABLE EXPANSION OF THE PINTSCH LIGHTING SYSTEM.**

The Pintsch system of car lighting has made wonderful progress, especially during the past 10 years, during which time the number of cars so lighted has trebled; so that in 1898 there are 85,600 cars equipped with this light. While the steam cars greatly exceed the street cars using the Pintsch light, the total of cable and electric cars so lighted runs into several thousand. The diagram is a graphical illustration of the progress made in the application of the Pintsch lighting system on the railroads of the world.

YEAR.	CARS.
1883	11,422
1885	17,600
1887	26,100
1889	35,096
1891	45,300
1893	54,175
1895	64,800
1898	85,600

**THE WABASH TO CONVENTION.**

The Wabash railroad officials have for several years past taken such special pains to look after the comfort of street railway delegates, both individually and collectively, that the road may fairly be said to have secured a large number of them as "regular customers". Assistant General Passenger Agent Palmer and N. C. Keeran, the Chicago city passenger agent, each year give the convention trains their personal attention, and the result has been a delightful trip, with little left for the passenger but to enjoy his ride to the utmost.

This year the announcements of the Wabash include a copy of the new brochure "The Continental Limited", which is one of the neatest and most attractive pieces of railroad advertising ever issued by any company. The Wabash train for Boston, which delegates going that route will take, is scheduled to leave Chicago at 12:02 noon, Sunday, September 4, reaching Detroit at 8:30 the same evening; Buffalo at 5 a. m., Monday, and destination at Boston at 5:50 Monday afternoon, in ample time for dinner.

Special sleepers will be reserved on this train for the exclusive use of the street railway party, including a special car for ladies, and all meals will be served en route on the new Wabash dining cars. The route is via Niagara Falls. For those who cannot leave Sunday noon, through sleepers are attached to the train leaving Chicago at 11:30 p. m., which arrives at Boston at 10:20 Tuesday morning, in time for the opening session. Returning trains leave Boston at 9:30 a. m. and 7 p. m. daily, departing from the Fitchburg depot. Further details or reservations may be had by calling on or addressing N. C. Keeran, City Passenger Agent, 97 Adams street, Chicago.

**TRACKS BENT BY HEAT.**

By the courtesy of Henry M. Williams, of Fort Wayne, Ind., we have received photographs, two of which are here reproduced, showing the tracks of the Fort Wayne Consolidated Electric Railway as bent by the heat on July 8, last. It was necessary to



STREET RAILWAY TRACKS BENT BY HEAT.

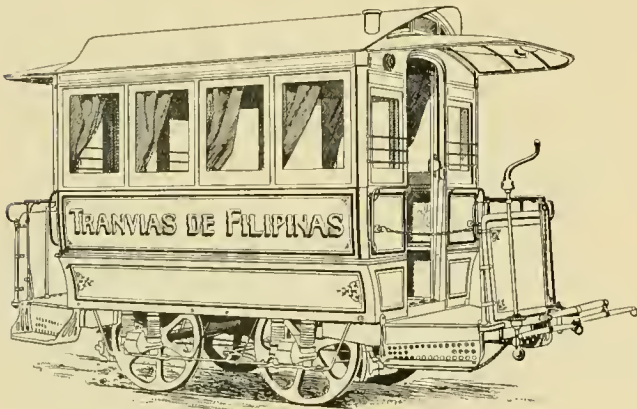
change the grade of the street, and as soon as they were uncovered the heat of the sun so expanded them as to kink them as shown.

**THE FLAG WON THE DAY.**

A contractor from the Keystone state related his experience last June in erecting a pole line along the Pennsylvania railroad, where the railroad officials with a force of 25 section hands attempted to prevent the work. There was one curve pole which was especially necessary, and the fight centered here. After considerable fighting the pole was raised, but the rub was to keep it there. Finally one of the trolley road men managed to climb the pole and drawing an American flag from under his coat nailed it to the "mast" and the day was won. The other crowd did not dare pull the pole down.

## IN THE PHILIPPINES.

The "Philadelphia Record" speaks of the street railway system of Manila as follows: "If Manila falls without a bombardment, and the city preserves to any degree its public works there will be a home-like influence felt by the invading army, particularly the Pennsylvania volunteers, when they ride through the streets of Manila in street cars, which were built in the city of Philadelphia. The total street car equipment of the 'Tranvías de Filipinas' was built by the J. G. Brill Company, Manila being one of the numerous foreign cities equipped with Brill cars. Cuts are shown illustrating both styles in use, the closed cars being 12 ft. length of body, are about the same length as the one-horse cars which but recently have disappeared from Filbert street. Their weight complete and in running order is less than 2,700 lbs. each, and they are drawn by the Philippine horses (each about the size of a Newfoundland dog). The grades on the line being numerous and the pulling capacity of the horses very slight, the ingenuity of the Brill officials was taxed to its utmost to furnish rolling stock to meet the requirements of the service. The open cars are 13 ft. 6 in. long over dashers and have a seating capacity for 20 passengers. The cars are marvels of strength and extreme lightness of weight."



BRILL CARS AT MANILA, PHILIPPINE ISLANDS.

## OIL FOR ROADBEDS.

A number of railroads are making the experiment of spraying their roadbeds with oil to keep down dust also incidentally preserving the ties and preventing the growth of vegetation in the ballast. It is possible that the interurban electric roads, especially those running over a private right of way, may find it advantageous to make this use of oil.

The method was invented by J. H. Nichol, assistant engineer of the West Jersey & Seashore division of the Pennsylvania, and it was first used on that line in April, 1897. It has also been used on the Long Island Railroad, the Philadelphia, Wilmington & Baltimore and the Boston & Albany.

The oil-spraying train consists of a sprinkling car, a tank car of oil and a locomotive which makes a speed of about four miles per hour and supplies compressed air or steam to aid in ejecting the oil. In the sprinkler-car, built by the Long Island Railroad, a 4-in. pipe runs the length of the car and may be connected to the tank car at either end; the sprinklers are three lengths of 2-in. pipe, perforated with slits 1-16 in. by 3 in. One of these pipes is 8 ft. long and suspended across the car near the center 5 in. above the rails; the other two, projecting on either side, are 7 ft. long and hung so that they may be given any desired angle with the vertical. There are also hand sprinklers to reach otherwise inaccessible portions of the roadbed. The rails are protected from the oil by shields 20 in. long placed under the sprinklers.

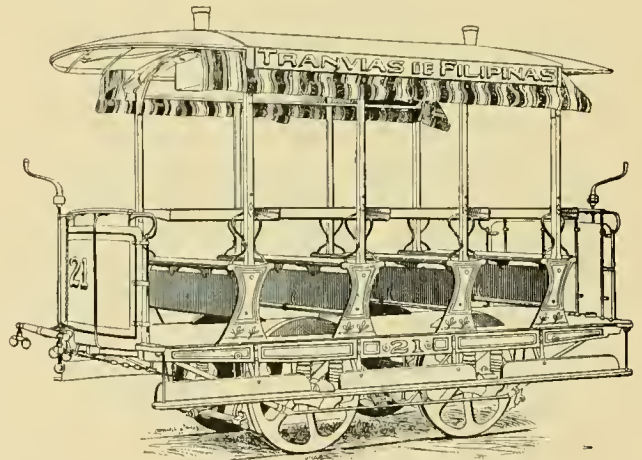
On the Long Island about 2,000 gals. of oil is used per mile. C. L. Addison, general roadmaster, states that one application penetrates the ballast to from 1 to 2 in., it being expected that one spraying per year for four years will thoroughly saturate the ballast. The oil used is non combustible and when first applied has a slight odor, not offensive, which is lost after a few days.

## FLAG RAISING AT NEW ORLEANS.

On July 12 there was a flag raising at Audubon Park, New Orleans, under the auspices of the Crescent City Railroad Company; this company's lines are operated by the New Orleans Traction Company, of which C. Densmore Wyman is general manager. The flag, a national ensign 18 ft. by 30 ft., and the pole, 110 ft. high, were the gifts of the street railway to the Audubon Park Commissioners.

The flag was raised in the presence of 7,000 persons, and on the platform were several hundred school children. Mr. Wyman made the presentation speech, being called upon at the last moment to take the place of Judge Lawrence O'Donnell, who was unexpectedly called away. In the course of a very happy address Mr. Wyman said:

"We love this glorious flag not only because it is in itself beautiful, not only because it waves over a land magnificent in its reaches and glorious in its future, not only because it tells the story of struggle and endeavor on the tented field, but we love it because it sings far and beyond a song of human freedom. We love it because it means that every man under its folds is a free man, able to work out his own birthright, descended not according to any human progeniture, but from the God who made us."



J. W. Gurley, president of the Park Commissioners, accepted the gift, and was followed by the orator of the day, Charles F. Buck, who commenced his speech with these words:

"The significance of that flag has already been so well expounded to you that I can do no better than to introduce myself to you with a sentiment taken from the American poet, George T. Morris, a song to our banner:

"The union of lakes and the union of lands,  
The union of States none can sever;  
The union of hearts and the union of lands,  
And the flag of our Union forever."

Music was a feature of the afternoon, and in the evening also there was a concert; the stand was brilliantly illuminated by electricity. At 9 o'clock there was an elaborate exhibition of fireworks provided by the company.

## ELECTRIC LOCOMOTIVES AT THE TAMPA CAMPS.

George D. Munsing, general manager of the Consumers' Electric Light & Street Railroad Company, of Tampa, Fla., advises us that his company has handled several hundred cars for the government at the Tampa camps, using one of the motor cars for a locomotive; the street railway connects with the railroads. The motor cars have been used for handling the trains loaded with siege guns; one of these cars equipped with two G. E. 1,000 motors has hauled trains of 25 empty cars and five loaded cars over grades that stalled a 30-ton steam locomotive.

The post office department has announced that the embargo is raised and mail will be forwarded to Spanish points.



## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

**Burden on Objector to Prove that Requisite Consents Have Not Been Obtained.***O'Brien v. Buffalo Traction Company (N. Y.), 52 N. Y. Supp. 322. June 18, 1898.*

The fourth appellate division of the supreme court of New York holds that in an action brought to restrain the construction of a street railway along a certain street on the ground that the requisite amount of consents have not been obtained that the burden is on the plaintiff to prove on the trial that fact.

**Courts Cannot Review Official Action About Locating Street Railways.***Silsby v. Lyle (Mich.), 75 N. W. Rep. 886. June 18, 1898.*

The Michigan statute provides that street railway companies may extend their roads through townships by the consent of the supervisor and highway commissioner, and the statute confers upon them the power to consent to regulations in reference to the construction, location, and operation of the portion of the road in the township. In this case, Silsby and another applied to the supreme court of the state for a writ of certiorari, as it is called, to review the action of the circuit court denying a writ of mandamus to compel Lyle, the commissioner of highways of the township of Bridgeport, to consent to the proposed route of a road through that township, the reason given for his refusing his consent being his nonapproval of the route through the township. But the supreme court denies the writ, on the ground that the power to locate the road is by the statute lodged in these township officials, and courts have not the power to review their action.

**Half Interest in Judgment Can be Assigned to Attorneys in Ohio.***Pittsburg, Cincinnati, Chicago & St. Louis Railway Company v. Volkert (O.), 50 N. E. Rep. 924. April 19, 1898.*

The supreme court of Ohio holds that legal services rendered by an attorney in the prosecution of a suit to judgment in the court of common pleas, and a promise to perform further services if error proceedings should be instituted in the circuit or supreme court, constitute a valid consideration for an assignment of one-half of such judgment, and the contract is not champertous.

Such assignment will convey to the assignee a property right in the judgment. This right is not enforceable in a suit at law at the instance of the assignee against the judgment debtor only, but may be enforced in equity.

It is not in the power of the judgment debtor, after knowledge of such assignment, therefore, further holds the court, to compromise the debt with the assignor alone and thus defeat the claim of the assignee to recover one-half of the proceeds of the judgment.

**Negligence of Driver Not Imputable to Guest in Case of Collision.***Bergold v. Nassau Electric Railway Company (N. Y.), 52 N. Y. Supp. 11. May 24, 1898.*

The second appellate division of the supreme court of New York holds that it was reversible error to charge the jury that the plaintiff in this case was chargeable with the negligence of the man driving the horse attached to the buggy in which she was struck by an electric street car, as she undertook to direct his movements, in telling him to slow up in approaching the car track. The court says, in explanation, that the law contemplates that a person, to be chargeable with the conduct of another, must have the power or authority to control, and such power or authority cannot be assumed in the case of a woman who accepts

an invitation to ride with a gentleman in his own vehicle, where he assumes to act as driver and to control the horse; and that the mere fact that this woman was on her guard, and uttered words of caution to the driver, did not constitute such direction and control of his actions as the law contemplates, to charge her with the responsibility for his negligence. The rule is different where the driver is the servant or agent of the person injured, or where both parties are engaged in a common employment.

**Does Not Depend on Statute to Hold Transfer Passenger Entitled to Wait for Seat.***Jenkins v. Brooklyn Heights Railroad Company (N. Y.), 51 N. Y. Supp. 868. May 7, 1898.*

A supplemental opinion to that reported on page 378 of the STREET RAILWAY REVIEW of June 15 has been called forth from the second appellate division of the supreme court of New York, by a motion for reargument, based upon the assumption by the member of the court who wrote the original opinion that section 104 of the railroad law of the state of New York applied to the facts of the case. But the court denies both the motion, and that it rested its determination on that assumption. It says it thinks that the contract between the passenger and the company, arising out of the payment of his fare, and the subsequent voluntary delivery to him of a transfer ticket, it being assumed that the company owned or operated the line on which fare was paid and the car on which the transfer was presented, it being its agent who gave the transfer ticket and its conductor to whom it was presented, entitled the passenger to passage upon the first car of the company which came along on the street to which the transfer was given, in which he could find a seat; and this wholly irrespective of the provisions of section 104 of the railroad law.

**Commissioners Cannot Review Their Own Determinations.***People v. Board of Railroad Commissioners (N. Y.), 51 N. Y. Supp. 781. May 4, 1898.*

Under a statutory provision such as that of section 100 of the railroad law of the state of New York, which authorizes a change of motive power for any street surface railroad upon the approval of the state board of railroad commissioners and the consent of the owners of one-half of the abutting property, the third appellate division of the supreme court of New York holds that, the conditions of the law having been complied with and the board having once approved of a change of motive power, it cannot thereafter, in the absence of express statutory authority, reopen and reconsider or review the case.

One reason given for this is that it is the general rule that officers of special jurisdiction cannot sit in review of their own orders, or vacate or annul them. It might be that the railroad commissioners ought to have the power to reconsider or review their action, says the court, but that is a question for the legislature. Nor does it pretend to discuss whether the state might not, by appropriate legislation or judicial proceeding, intervene.

But the court says that the general rule is that where there is a grant to a corporation from the state, or in pursuance of authority given by the state, of a franchise or privilege in the nature of property, and the grant is accepted, it cannot thereafter be revoked against the consent of the corporation, unless there is a right reserved sufficiently broad to accomplish the purpose. And it holds that, in this particular instance, the Forty-Second Street, Manhattanville & St. Nicholas Avenue Railway Company, when it obtained the consents of the property holders, as required by the statute, and the approval of the board to change its motive power from horse power to an underground electric system, on acceptance acquired a privilege in the nature of a franchise, entitled to protection under the rule applicable to such cases.

### Early Municipal Resolutions Do Not Obligate to Surrender of Roads.

*Potter v. Collins, Commissioner of Public Works (N. Y.), 50 N. E. Rep. 413. May 10, 1898.*

The court of appeals of New York has answered in the negative the question certified to it by the first appellate division of the supreme court of the state as to whether, independently of and without giving any effect to chapter 478 of the New York Laws of 1874, the Eighth Avenue Railroad Company is under obligation to surrender, convey, and transfer to the corporation of the city of New York, whenever required so to do, the railroads built on the routes described in resolutions of the common council approved July 20, 1851, and adopted December 13, 1852, respectively, the first of which resolutions required the execution of an agreement to do it, upon payment of its cost and 10 per cent. in addition; and it denies that, independently of said chapter 478, the city has any legal right to require the surrender, conveyance or transfer to it of said roads, or either of them.

Of more or less general interest, it may be noted that the court holds that the resolution of 1851 was void because it undertook to authorize the laying of railroad tracks in the city streets and avenues, or attempted to grant a right to an exclusive interest in the streets, while all that the municipal corporation could do, within the provisions of the general railroad act of 1850, was to assent to the construction of a railroad. What it tried to do, the court says, the legislature, possessing a supreme authority over the public territory, within constitutional limitations, could, of course, do; but to attribute such a power to the municipal corporation would be foreign to the concept of such an administrative agency of government. Nor could such municipal action be defended upon the ground that it constituted a license. As well say that the creature could create as to assert that such corporations, in the guise of a license, could endow an association of persons with rights and powers which would enable it to use the public streets for private gain, to the same extent and with like effect as if possessing the franchise or privilege which the sovereign power alone could grant.

### Liability for Conductor Stumbling and Throwing Passenger Off Running Board.

*Whalen v. Consolidated Traction Company (N. J.), 40 Atl. Rep. 645. June 20, 1898.*

The party who brought this action to recover damages testified that, while a passenger standing upon the running board of a crowded trolley car, the conductor, who had passed by him several times collecting fares, somehow stumbled, though he did not know how, and caught hold of him by the shoulder, in trying to catch the upright, and threw him off the car.

On this state of the case, the court of errors and appeals of New Jersey pronounces a nonsuit erroneous.

The court says that by taking his stand upon the outside running board of the car, the passenger assumed the risk of such dangers as were obviously incident to that position, while the company, by accepting him there as a passenger, owed to him the duty arising out of that relation. Consequently, while one of the obvious dangers of his position was that resulting from the use of the board by the conductor, the court insists, it would nevertheless be competent for the passenger to show that in the manner of using it the conductor had been guilty of a breach of the company's duty towards him, which would lie in a lack of due care on the part of the conductor as he passed along the board, which would, under the circumstances, be the only breach of duty chargeable against the company.

When a passenger in charge of a common carrier shows that he was injured through some defect in the appliances of the carrier, or through some act or omission of the carriers' servant, which might have been prevented by a high degree of care, the jury have the right to infer negligence attributable to the carrier, unless the carrier proves that due care was exercised. And the court thinks that it is certainly not irrational to infer that the conductor, who had passed so often over the same place under apparently the same conditions without stumbling, on this occa-

sion stumbled through a failure to exercise that high degree of care required of him. At any rate, it holds, to preclude the jury from drawing such an inference, the company should have been called on to explain the true cause of the occurrence.

### Not an Unlawful Construction on the Highway.

*Miller v. Lebanon & Anurville Street Railway Company (Pa.), 40 Atl. Rep. 413. May 16, 1898.*

Recovery of damages for the death of a child killed in some unexplained manner, after stopping at least 5 ft. away to let an electric car pass, was sought on the ground that the company had placed on the highway an unlawful and dangerous construction, which caused the death of the child. At the place where the accident happened, the tracks were laid by direction of the township supervisors in a trench, so that the tracks were 8 in. lower than the surface of the road, because it had apparently been their intention to change the grade of the road at that place, and they desired the tracks laid so that they would be level with the surface of the road when the change was made.

The theory advanced at the trial was that the company had no authority, even if directed by the supervisors, to make the trench in which its tracks were laid; that the sloping side of the trench nearest the roadway, in connection with a mound of earth formed by passing wagons by displacing and throwing up the dirt between the traveled part of the road and the car tracks, increased the danger to any one who might fall on the highway near the tracks; that, if the trench and mound had not been there, the child, when she fell, would have remained on the surface of the road, and not have rolled down under the wheels of the car.

But the supreme court of Pennsylvania holds that, in following the direction of the supervisors, there was no violation by the company of its duty to conform to the grade of the road in laying its tracks. This was what it was attempting to do. It would have been folly to have laid the tracks to conform to a surface which was to be changed the next day or the next week.

The difficulty of proving how the accident happened, the court further holds, did not relieve the parties suing of the burden of proving that it was caused by the negligence of the company, which they failed to do. And it affirms a judgment in favor of the company.

### Care Required in Attempting to Switch Cars from One Track to Another.

*Stierle v. Union Railway Company (N. Y.), 50 N. E. Rep. 419. May 10, 1898.*

The obligation of carriers of passengers to exercise the highest degree of care which human prudence and foresight can suggest, the court of appeals of New York holds, exists only with respect to those results which are naturally to be apprehended from unsafe roadbeds, defective machinery, imperfect cars, and other conditions endangering the success of the undertaking.

In every case the degree of care to be exercised is dependent upon the circumstances, and, if the accident is attributable to the existence of defects in the road, or in the mechanical appliances availed of for the operation of the road, by reason of which there was a possibility of loss of life or limb to the traveling public, the strict rule requiring the highest degree of human skill would be applicable.

The common carrier is not an insurer of the safety of its passengers, but it is, and properly should be, bound to use its utmost skill and vigilance to guard against the possibility of accidents from the condition of its road and of the machinery used in the transportation of passengers.

Applying these principles to the case before it, in which the party suing alleged that he was injured because of the negligent manner in which the driver of the street car on which he was a passenger attempted to move or switch the car from one track to the other in order to cross a bridge that was being repaired, permitting the use of only one track, the court holds that the company was liable only for the failure of the driver to use that skill and care which would be required of an ordinarily careful and prudent man.



Justices O'Brien and Vann dissent on the ground that the reason which requires the exercise of the highest degree of care by a carrier of passengers with reference to roadbed and machinery extends with equal force to the use of the roadbed and machinery in the operation of cars, and that there should not be a higher degree of care required in providing appliances than in using them.

#### Individual Liability in Wrongfully Changing Grade of Streets.

*Berkson v. Kansas City Cable Railway Company (Mo.), 45 S. W. Rep. 1119. May 24, 1898.*

This was an action begun to recover damages to abutting private property, charged to have resulted from a change of grade of a street; the Kansas City Cable Railway Company, the Kansas City & Independence Railway Company, and James Lillis, being made defendants. The jury found against the cable-car company, assessing the damages at \$3,500, in accordance with which judgment was entered against that company, and in favor of the other two defendants, from which judgment all of the defendants appealed.

This leads the supreme court of Missouri, division No. 1, to say that if the jury found that the cable car company was guilty of a tort, in the nature of a trespass, in entering upon and changing the grade of the street in front of the plaintiff's property, it was liable for the entire amount of damages caused by its act, without reference to the question as to who else or how many others participated in the same wrong, because between joint wrongdoers no right of contribution exists, so that one cannot be heard to complain that all guilty of the wrong have not been included in the same action, or included in one common judgment as the result of its prosecution.

The court further justifies the rendition of the judgment against the cable car company alone, on the ground that the jury could hardly have resisted the conclusion, from the evidence, that the Kansas City & Independence Railway Company was a mere substanceless corporate creation, used to conceal from view the real operator, the cable car company.

#### Against Walking on Track Longitudinally.

*Gluhartin v. Luckawanna Valley Rapid-Transit Company (Pa.), 40 Atl. Rep. 322. May 16, 1898.*

While city passenger railway companies have not an exclusive right to the use of the parts of the streets occupied by their tracks, the supreme court of Pennsylvania says that they have a right of way and a right to an unobstructed track for the passage of their cars. In the use of their tracks their rights are superior to those of the public. The convenience of the individual in the use of the part of the street to which the cars are confined must give way to the convenience of the public who use the cars.

The use of electricity as a motive power by street railway companies has greatly increased the danger to those who drive or walk on city streets. Many uses of streets which were formerly comparatively safe are now extremely dangerous. Of the increased danger all persons who use the streets must take notice, and a high degree of watchfulness and care is required of them.

With these principles in mind, the court reverses a judgment for personal injuries rendered against a street railway company in a case that was tried for the claimant on the theory that she had a right to walk on the track longitudinally, and that if she was vigilant in watching for the approach of a car she had done her whole duty, a view adopted by the trial judge. The track was a single one, with turnouts, in a city street. She lived on the street, and was returning home at night, choosing to walk on the track because the surface there was hard and smooth while the carriage-way was dusty and the sidewalks uneven in places.

The motorman did not see her until she was struck—from behind—and he stopped the car within its length. It also appeared that the headlight was not burning, and that the gong was defective, and did not always ring.

But the supreme court says that a reasonably prudent person

would not have been on the track, under the circumstances, especially knowing that a car was coming behind, and that it could not be heard on account of other noises in the neighborhood; and that she was guilty of negligence in being there. Her right to use the track was subordinate to that of the company.

#### DEATH OF CHARLES B. REAVIS.

Charles Blair Reavis, ex-vice president of the Street Railway Accountants' Association, one of its organizers and always a



C. B. REAVIS.

most earnest and enthusiastic worker; and auditor of the Augusta (Ga.) Railway & Electrical Company, died suddenly at the Augusta city hospital on August 2, of Bright's disease. His death will bring sadness to every member, as it has to the city of his home, where he had a very large circle of friends. His illness lasted only a few days and was not thought to be critical until the last few hours. His wife was visiting her parents in Kansas City at the time and did not reach Augusta until after his death. Mr. Reavis was only 34 years of age. He was born at Warrensburg, Mo., in 1864 and was associated with Col. Dyer in Kansas City for a number of years, afterwards accompanying him to Augusta to take the position which he held up to the time of his death. He was married two years ago to Miss Mary Wells of Kansas City, and both were present at the convention last year. He will be greatly missed by the Accountants' Association, where his opinions were highly regarded, and his genial disposition made everyone his friend.

#### DECISION AS TO ADVERTISING RACK PATENT.

About a year ago the Newton (Mass.) Street Railway Company was enjoined from using certain advertising racks in its cars, the U. S. circuit judge holding them to infringe upon U. S. letters-patent No. 380,096, granted in 1888 to I. H. Randall, and controlled by the American Street Car Advertising Company.

An appeal was taken to the circuit court of appeals, where a decision was rendered July 19, 1898, in which the court said: "While we entertain doubts where the complainant's device involves invention or patentability, yet admitting that both were found in it, the patent must be held so close and narrow that it is not infringed by a structure that cannot be described in the language of the patent as an article complete in itself adapted to be readily attached to the car at the place specified, or in the language impressed upon the patent office, a rack 'complete and in condition to receive the cards when not fastened to the car.' We are clear, therefore, that the respondent's structure does not infringe."

This is probably the last that will be heard of litigation about advertising mouldings in cars.

#### TAKING UP TRACKS.

The Helena (Mont.) Power & Light Company succeeded to a street railway franchise granted in 1891, and continued to operate the road until recently, when it desired to stop the service into the addition to the city known as Lenox, and remove the track.

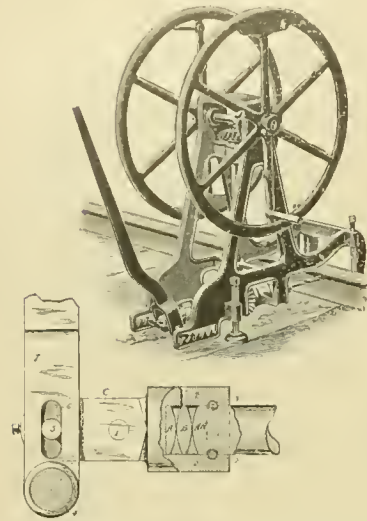
Two citizens of Lenox sought to enjoin this action but have been defeated in the lower court, the judge holding the franchise grant to be permissive, and not by its terms imposing any obligation to continue the car service for the whole term of the grant.

## THE SWEET TRACK DRILL.

The accompanying illustrations show the Sweet track drill made by the Michigan Manufacturing Company, of Ypsilanti, Mich.

First is a view of the drill which is capable of drilling holes up to 1 in. in diameter. The records for speed are three 1/2-in. holes in a 5/8-in. rail web in 64 seconds, and 6,500 13-32-holes for bond wires in 65-lb. rails in nine days, one man only working the drill. The wheels may be used as a truck to move the machine, a very convenient arrangement.

Below is a section of the improved end bearing which has been applied to this drill; it was adopted only after the most careful trial of many other devices and demonstrated it to be the best for the purpose. The hand lever is



provided with a slot in which works the pivot, 5. This pivot is held in place by a set screw in the rear end of the link, C, which in turn is attached to the backward extending part of the socket at 7; 2-2 is the cup or socket, in which the oval steel piece, 1, is firmly fastened. 1-1 is the end of the drill shaft, also steel. B is an elliptical shaped piece of steel and turns freely between the two points of contact, thus effectively dividing the friction; 3-3 are pins attached to 2-2, which work freely in a groove cut on the drill shaft, and are merely to keep the shaft in position as the lever is moved forward or back. As the lever is so moved the end of rod with the link C, raises or lowers, thus preventing binding of the cup on the end of the shaft.

## SAND BOXES FOR STREET RAILWAYS.

The illustration shows a sectional view of a sand box made by the Ham Sand Box Company, of Troy, N. Y., and known as the Ham sand box, style 4.

In this design the box is placed inside the car and thus is overcome the only objection urged against style 3, that is, that being under the car, it might draw moisture. The spout and lever project through one hole in the floor and connections to the lever can be easily made. The points of superiority claimed for this device are: It has no valve or worm gear; it will

not leak; it has few parts; water can not be driven up the spout to wet the sand.

The operation is readily understood; the lever pulls the hoe forward and a spring throws it back; by alternately pressing and releasing the lever a fine stream of sand is delivered.

Of eastern roads using the Ham boxes may be mentioned the Newport Street Railway; the Commonwealth Avenue, Boston; the Union Street Railway, New Bedford; the Bristol and Plainville. They are also in use on the Richmond (Va.) Traction Company's cars, and the cars of the Glasgow Corporation road, Glasgow, Scotland, have recently been equipped. The 100 cars now building by the Stephenson Company for the Chicago City Railway are to be fitted with the style 3 box; this selection was made after a thorough trial. H. A. Whitman, 200 Lake street, Chicago, represents this company in the west.

On August 17 the General Electric Company, at a meeting of stockholders in Schenectady reduced its capital stock to \$20,827,000 a decrease of about one-half.

## PROVIDENCE FENDERS ON 5,000 CARS.

The Providence fender and wheel guard is now installed and in actual daily operation on more than 5,000 electric and cable cars, a number which is several times that of all other types of fender combined. The fact that no road which has once adopted the Providence has ever been known to take them off or change, and that all are constantly increasing the number as new cars are put on, effectively tell the story of their efficiency and practicability. General Manager Woodward informed our representative, when in Providence a few days ago, that he is now equipping cars in five cities and that the works have been crowded right up to the full capacity for several months past, and additional manufacturing facilities will certainly be necessary in the near future if only a part of the promised orders are received. Mr. Woodward says: "Our fender is not quite as cheap in first cost as some, but it is the best; gives no trouble in getting out of order; can always be absolutely depended on to do its work; and in the end is really the cheapest."

A complete exhibit will be made at the Boston convention.

## THE MOTOR SUSPENSION CASES.

The Walker Company, Cleveland, O., sends us under date of July 13, the following:

"We beg to call attention to a letter recently mailed to you by the General Electric Company, dated Schenectady, N. Y., June 1, 1898, and signed C. A. Coffin, President.

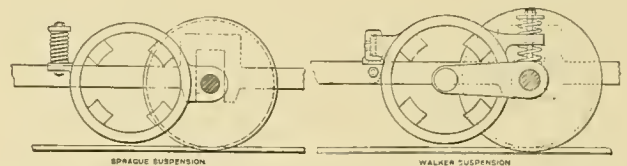
"This letter concerns a decision made by the U. S. Circuit Court of Appeals of the Second Circuit, upon a patent issued to Frank J. Sprague for an improvement in electric railway motors.

"The statements made in this letter we believe to be willfully misleading, and we feel it necessary in justice to ourselves and to the many users of street railway apparatus to correct the false impression so widely circulated.

"The motor suspension now used by the Walker Company is not the suspension that came to trial, and the statement made in the letter that 'practically every form of motor suspension now in use' is an infringement of patents controlled by the General Electric Company, is erroneous. We present for your consideration the enclosed statement of the situation, believing that it will be of sufficient interest to command your attention.

S. H. SHORT, Vice-President."

The illustrations are taken from the circular accompanying the foregoing and show two suspensions. The circular in part is as follows: By referring to the specifications of the Sprague patent itself it will be seen that the motor was journaled to the axle rigidly and supported at its nose, or at that side of the motor



farthest from the axle, by spiral springs attached to a cross bar resting on the side bar of the truck. We give a diagram of this suspension which will be seen conforms with the description given in the patent. The Walker suspension now in general use is not the suspension which was in question in the case referred to in the letter. It is entirely different from the Sprague suspension and is a great improvement over it in that the motor itself is not journaled to the axle, but has its weight supported directly over the axle through spiral springs. These springs take up all of the jar and hammer blow exactly at the point where it will do the most good. The nose of the Walker motor at that side of the motor farthest from the axle is supported rigidly upon a cross bar which is attached to the side bar of the truck. This rigid suspension is of great value, as it keeps the motor from rapidly oscillating up and down during the acceleration and braking of the car. One of the main objects of this method of suspension is to prevent this oscillation which so often breaks and wears out the cables passing from the car body to the motor.



## THE ELECTRIC RAILWAY FIELD IN SOUTH AMERICA.

Prepared Expressly for the STREET RAILWAY REVIEW by the Philadelphia Commercial Museum.

The progress of electricity has attained to a remarkable vigor in Buenos Aires and the Argentine generally within a recent period, and it is promised that within the next four years the power wire will have completely displaced the horse as the source of propulsion throughout the whole of the street car lines. There are now nine horse "tramway" companies operating over 230 miles of streets. These lines employ about 5,000 men and nearly 10,000 horses.

Early in June last a representative of La Metropolitana Tramway Company proposed to the municipality to change the tractive power from horses to the trolley system. He promised that the feeder cables should be under ground, divided into sections of one kilometer. The power would be furnished from a plant now being constructed by the Berlin Electrical Company. The latter company has organized a subsidiary company for the special purpose of extending the transmission of power, by electricity, throughout Argentina. The company is known as the German Transatlantic Electric Company, and has the backing of the German Transatlantic Bank at Buenos Aires, which practically organized it. The German Electric Company, it should have been stated, recently purchased the property of the La Metropolitana line, obtaining the company's equipment and the right of way of over 21 miles of streets through a busy part of the city, for what is considered the low price of 1,400,000 pesos (about \$300,000).

Within the last three months petitions for concessions for electric roads have been presented to the municipality by quite a number of people. The applications embraced both the trolley, underground and accumulator systems. A Mr. Müller asked for permission to establish a system to be worked by accumulators between the new slaughter yards and Flores Palermo and the southern part of the city. The River Plate Electric Light & Traction Company presented four or five petitions for the use of the overhead system in different sections.

A petition by one Victor Nicolutti, for the construction and working of a line for freight and passengers by steam or electricity between the new Mata Deros and the termination of the Anglo Argentine Tramway Company in Floresta, has been favorably reported by the Public Works Department of the municipality. The conditions upon which the department will grant the concession are: That the land required by the line shall be purchased by the concessionaires and converted into public streets; that the line shall be doubled, and road guards placed at every crossing. The concession would run for 20 years, after which the material and land would revert to the municipality without payment.

Among other proposals for the application of the electric system presented, was one from T. R. Betzell for a road to run from Plaza Mayo through the streets of Victoria, Martin Garcia, Iriala, California, and Vieytas to Paseo Colon and as far as Barracas Bridge. The applicants offered to adopt the electric system, to water the streets during the summer, to begin work within four months after the contract is signed, and finish within a year, and to deposit \$10,000 as a guarantee. They ask for 60 years concession and place the fare at 10 cents.

Another applicant for the construction of an electric line is E. Rodriguez, who has applied for concessions for about all the streets in the city. A petition by A. Parcus & Co, for the construction of an electric system has been denied, the petitioners having furnished neither plans nor data. James G. Killey is one of a number of applicants who want permission to go through the Paseo de Julio, one of the principal thoroughfares of the city. His proposition is to build two underground lines, one to run from the Plaza de Mayo through Bolivar and Caseros streets to the Constitution Depot, and the other from the Plaza de Mayo through Reconquista and Paseo de Julio streets to the Retiro.

Among the work which is now being prosecuted is the construction of a section of the Buenos Aires Electric Tramway from Calle Montevideo to the Recoleta. The line will run through

Retiro Station and its present terminus will be at Plaza de Mayo. It is expected that by the end of the year the line will reach Belgrano.

Some time ago the A. Heymenann Company obtained a concession for a system of elevated "tramways". For some reason or other not stated in the latest advices, the concessionaires have been unable to execute their project and the concession has been declared lapsed.

The people of Buenos Aires are very much exercised just now regarding a report made by Dr. Bahia favoring the use of a bare copper wire for the neutral three-wire system by the German Electric Light Company. The director of public lighting has emphatically objected to the use of a naked wire and petitions have poured into the Intendente and the City Council from the gas and electric light companies protesting against the use of the bare wire. Acting upon the report of Dr. Bahia the Intendente gave the German Company permission to use the bare wire and the local electricians have split into two camps on the question.

The report of the director of the Anglo-Argentine Tramways for 1897 shows receipts for the year of \$1,063,005 against \$1,030,540 in 1896, and working expenses of \$778,840 in 1897 against \$708,170 in 1896. The increase in the working expenses was due to a rise in the price of horse feed. The lines paid a dividend of 75 cents per share for the year.

The shareholders of the City of Buenos Aires Tramway Company at their general meeting discussed the matter of substituting electrical for horse traction. The conclusions arrived at will be regarded as rather antiquated by Americans. These were that the "principal or only recommendation of electric traction is its increased speed; that this was rendered impossible on most of the company's lines by the heavy and slow traffic which encumbers the streets; that there was danger from the electric train in a narrow street on account of its greater length and the sharpness of the curves, and electric traction will be found to have advantages in suburban traffic only."

A correspondent writing about the traction system of Rosario, a city of 55,000 people up the Plate from Buenos Aires, says: "The days of tramways worked by horses in great cities are drawing to a close, and soon the miserable tram horse will be seen no more. The time is fast approaching when they will all be worked by electric power, to the great comfort and convenience not of passengers only, but also of the non-traveling public. All the dirt and most of the noise will be done away with and the cost after the first will be less. We may, perhaps, some day, possibly before long, see all the tram lines of Rosario united into one company, under one management and worked by electricity."

In view of the progress being made in electrical and mechanical works in Argentina a number of gentlemen connected with those operations have agreed that the time is opportune for the establishment of an Institution for Mechanical and Electrical Engineers. At the present time there is no place in which foreign engineers can meet and discuss questions of the day. The only "center" is that known as the "Centro de Ingenieros Nacionales", whose doors are opened only to those who hold an Argentine University diploma. The formation of a new institution is a foregone conclusion. Electricity is making rapid strides in the country and there are a number of engineers connected with the electric light companies, of which there are about ten in the country, the telephone, the electric traction, and telegraph companies, and the different steam railroads.

There is a possibility that in the future the magnificent water power derived from the strongly flowing rivers that rise in the Andes will be utilized for the generation of electricity for use of many light railroad systems throughout Argentina. Something has been said about exchanging electricity for steam power on one of the steam roads, but nothing definite on the matter appears to be known.

The court at Duluth, Minn., has directed its receiver in charge of the street railway to withdraw the order requiring its men to be in uniform if they wish to ride free, a badge being deemed sufficient identification; he upholds an order that the men shall not eat lunches in the cars.



FANEUIL HALL—THE CRADLE OF LIBERTY.

### INTERESTING SERVICE OF THE FALK CAST-WELDED RAIL JOINT.

The raising of the net-work of steam railroad tracks at Clark and 16th streets, this city, involves one of the most difficult engineering problems encountered by any road. The Clark street line of the Chicago City Railway which formerly crossed these steam tracks at grade, has been shut down already several weeks, and will not get into operation for some time to come. When it does the car tracks will use the street grade and the steam roads will pass overhead and underneath.

As the Clark street line has become one of the main arteries of the City Railway since the adoption of electricity, and will carry upwards of 200 cars per hour a good portion of the day, the company has taken advantage of the enforced blockade to relay its tracks, which otherwise would not have been renewed for three years to come. This track being taken up is of 52-lb. Johnson girder, 4½ in. high, and was laid nearly 10 years ago, when the service was exclusively by horse cars. When electricians went on the joints quickly went down, and the wear of the entire track was greatly aggravated by the hundreds of teams loaded with the heaviest kind of freight for the numerous freight houses along Clark street. Three years ago it was about decided to take up this track and relay with new rail when the Falk Company proposed to extend the life of the track by cast-welding the joints. This was done being among the first of old rail to be so jointed. The result has been in every way satisfactory, and were it not for the importance of the line and the objection to shutting it down when the time comes to renew, the present track would have answered for probably three or four years more. But it will be taken up now and a heavy 7-in. section put down. The question what to do with the old rail taken up which is too good to scrap, has been solved in a very unique manner. Every alternate joint will be sawed out, leaving a rail about 58 ft. long with one cast-welded joint midway. This rail will be laid on a line of lighter travel, and the new rail ends made by the sawing will be cast welded and when so laid will be good for several years' use. It will readily be seen what the saving to the company will be by this means.

The new 35th street line of the same company has been cast-welded, without the addition of any rail bonds, Electrician Knox having become satisfied that the conductivity of the Falk joint is

more than ample. Our readers will recall our published test of the conductivity of these joints made a few months ago by Chief Electrician Chapman, of the Yerkes system. He took up some old joints from track, and tests showed a surprisingly high degree of conductivity, sufficient for all ordinary purposes. The joints he then tested had been made by the earlier method of cleaning the rail ends before welding, which is far inferior to the system now employed by the Falk people, which is to clean the rail end by means of portable sand blast just prior to the welding and which cuts away every foreign substance and leaves a bright and clean surface to join and weld. The 35th street line just mentioned was prepared with this sand blast and the results are highly satisfactory.

The Falk Company is now working on a large contract for the Metropolitan in Kansas City, where the joint is in great favor, as indeed it proves to be wherever it is tried. The foreign work this season has been large, and the joint is rapidly growing in favor abroad.

### WATER AND OIL CHEMISTRY.

Two enemies of economy in the power station are bad feed water and poor lubricating oils. It is quite obvious that no single compound can be made which will prove efficacious in removing boiler incrustation or in preventing the formation of scale or corrosive action, because such formations and corrosive actions result from the use of waters different from each other. The mineral salts have different physical and chemical properties, and the percentage of injurious ingredients varies in different waters. Surely such conditions require to be intelligently investigated before a remedy is applied, and each case should be diagnosed separately before prescribing for it.

The Dearborn Drug & Chemical Works, of Chicago, are manu-



LABORATORY OF THE DEARBORN DRUG AND CHEMICAL WORKS.

facturing and analytical chemists, and have proceeded along such lines as these, meeting with great success. They have an extensive laboratory and when called upon to treat a bad boiler water, first analyze the water, and write a prescription. The prescription is sent to the works, recorded and numbered, and the compound made; it can be readily refilled when wanted. The compounds made are of purely vegetable composition, analytically prepared to meet the requirements of the mineral ingredients and other objectionable constituents of the water, the percentage of each mineral salt governing the percentage of the antidotal ingredient of the compound. By these methods there is no excess or deficiency of any part of the compound, every pound being utilized in the reaction taking place; there is no mechanical, unknown or unlooked for result obtained from the use of these goods.

The oil question is also handled in an intelligent manner. This company makes the Dearborn oils, each one named for a fort, and the qualities of the different oils adapt them for different uses. The Dearborn Drug & Chemical Works are oil chemists and inspectors to the consumer, and prepare special formulas to suit the requirements that may be presented in each individual case. Unless boiler compounds and lubricating oils are carefully chosen for the work to be done it is idle to expect satisfactory results.



**STREET RAILWAY MEN WHO HAVE DIED SINCE LAST CONVENTION.**

Each recurring convention, marking as it does another mile post in the path of time, brings with it the feeling of regret and sorrow for friends whose familiar faces we shall see no more. The following is a list of those in active street railway work, or intimately connected with it, whose death has occurred since the last convention meeting:

Lemuel Ammerman, president, Lackawanna Valley Traction Company, October 8, 1897.

Dwight S. Smith, Jackson (Mich.) Street Railway, November 11, 1897.

John Savage, superintendent, Detroit & Oakland road, December 1, 1897.

Ross Mackenzie, Nelson, B. C.

David W. Dickson, president, Philadelphia Traction Company, December 13, 1897.

J. Willis Kettlestrings, purchasing agent, North Chicago Street Railroad Company, December 29, 1897.

O. B. Shallenberger, consulting electrician, Westinghouse Electric & Manufacturing Company, January 23, 1898.

John S. Pugh, of the John Stephenson Company.

Burr K. Field, vice-president, Berlin Iron Bridge Company.

H. W. Johns, president, H. W. Johns Company, February 8, 1898.

James H. Rhotabamel, Columbia Lamp Company, St. Louis, February 17, 1898.

William J. Ashmead, Ajax Metal Company, February 26, 1898.

James A. Stratton, secretary and treasurer, Birmingham Railway & Electric Company, February 28, 1898.

Denis Doren, general superintendent of construction, Western Union Telegraph Company.

Frederick Krutz, former president New Orleans Street Railway Company.

Li. Col. H. C. S. Dyer, president, Colorado & Cripple Creek Electric Short Line Railway.

J. K. Waterman, manager, Cape Electric Railways, Cape Town.

R. F. Baker, president, Columbia Railway Company, Washington, D. C.

Charles B. Pratt, president, Worcester (Mass.) Consolidated Street Railway Company, May 10, 1898.

John J. Shipherd, Cleveland, June 1, 1898.

Julius S. Grinnell, general counsel, Chicago City Railway, June 8, 1898.

Morris W. Hall, secretary, Camden & Suburban Railway Company, Camden, N. J.

Dr. Azariah Everett, former president, East Cleveland Railway Company, June 17, 1898.

E. H. Bennet, president, Babcock & Wilcox Company, June 27, 1898.

M. W. Squiers, former superintendent, North Chicago Street Railroad Company, June 29, 1898.

Charles O. Richardson, treasurer, Worcester Construction Company, Worcester, Mass., July 6, 1898.

Capt. John A. Williamson, former superintendent, Cincinnati, Newport & Covington Railway Company, July 8, 1898.

J. H. Rafferty, secretary, Waterloo (Ia.) & Cedar Falls Rapid Transit Company, July 20, 1898.

Charles B. Reavis, auditor, Augusta (Ga.) Railway Company, August 2, 1898.

Adolph Sutro, San Francisco, Cal., August 8, 1898.

William H. Blood, division superintendent, Brooklyn Heights Railroad Company.

**SANDUSKY, O., ROAD SOLD.**

The Sandusky (O.) Street Railway was sold on July 9, by the receiver, to Judge Bentley, of Cleveland, the legal representative of Thomas Wood's Cleveland and Norwalk syndicate, which has in view building a line to Lorain. The bid was \$60,024, exactly two-thirds of the appraised value; no other bids were made as Judge Bentley's principals had secured provisional control of 90 per cent of the stock and bonds.

**CHRISTENSEN ENGINEERING COMPANY'S SUCCESSFUL AIR BRAKE.**

When it is remembered that this company made its introduction of air braking apparatus at the Niagara Falls convention, less than one year ago, the number of installations which have been made and their uniformly successful operation constitutes



WHERE WE RODE LAST YEAR.

a record quite remarkable. It is a strong testimonial to the fact that experimentation has been done quietly and in advance of putting on the market, instead of rushing into sales and correcting the mistakes later. While the Christensen Company very honestly admits it does not claim absolute perfection, it does guarantee what it believes to be by far the best air brake for street railway work in existence, and the improvements which time brings to all machinery will doubtless be of minor character, for the brake has proved its efficiency in that final and only absolute test—hard daily service.



METROPOLITAN TRAIN—CHICAGO.

Our readers who attended the Niagara Falls convention will never forget the thrilling ride down the Gorge—the finest ride in the world, and our illustration will recall afresh the pleasures of the trip. Incidentally the cut will also show one of the cars equipped with the Christensen air brake. If there ever was a place where absolute safety is essential it is here. In this case an axle compressor is used.

Another and entirely different class of service is illustrated in the train of cars on the Metropolitan Elevated in Chicago, a road entitled in its construction and operation to take first rank as the model elevated road in the world. General Manager Baker is not much given to writing testimonials, but speaks in very high terms of the excellent work of these brakes on his road.

The reader would at first thought scarcely look to the mount-



MILWAUKEE CAR WITH CHRISTENSEN EQUIPMENT.

ains of Colorado for the most advanced type of equipment, when so many roads in "the states" are still operating under the time honored system of the hand brake. Our illustration of two of the cars on the Cripple Creek District Railway shows the type of heavy car used and also indicates the steep character of grade which prevails from one end of the line to the other. In addition high speed is required, which makes an air brake, not a matter of choice, but necessity. The operation of an air brake is rendered more difficult by reason of the high altitude, yet these 20-ton passenger cars, and the heavy freight cars loaded with ore are handled with the utmost ease and certainty, and the general manager of the road, L. D. Ross, writes: "The question of braking the cars as they descend the mountains was one wherein some railway engineers apprehended we would meet with trouble, but so far not the slightest difficulty has occurred. With the Christensen air brake we are able to make whatever speed we desire."

Nor is the brake one of those prophets without honor in its own country. Milwaukee, the place of its manufacture, has 10 equipments on the recently completed Waukesha line. These are independent motor equipments and are working beautifully. Twenty sets are also working on the Suburban Railroad, Chicago, one of the Yerkes lines, which runs from the terminus of the Lake Street "L" to La Grange. Some other installations on



AT CRIPPLE CREEK.

well known lines are: 4 on the Fox River Valley, Appleton, Wis.; 16 on the Cleveland-Berea road; 3 on the Akron, Bedford & Cleveland; 4 on the Union Traction, Anderson, Ind.; 11 on the Lowell, Lawrence & Haverhill; 9 on the Taunton & Brockton; 5 on New Paltz & Walkill Valley, Pa.; 6 on Brooklyn Elevated and 6 on the N. Y., N. H. & H., under direction of Col. N. H. Heft. Also one compressor on a Belt Line locomotive of the B. & O.

The largest installation to date, however, is the equipment of the 120 cars on the South Side Elevated, Chicago, known as the "Alley L", under whose cars are placed Christensen No. 1 compressors, making each car complete within itself.

Starting with an empty reservoir, 90 lbs. of air is pumped into the reservoir in two minutes and thirty seconds. It requires about an 8 lb. reduction on train line for a good stop when the brakes are properly adjusted, which means a reduction of 1½ to 2 lbs. on a storage line.

The capacity of each compressor is 9 cu. ft. of free air per



T. & B. STANDARD CAR.

minute; 85 to 90 lbs. of air is carried in storage reservoir, and the maximum pressure on train line is 70 lbs.

By means of an automatic electric switch controller, uniform, maximum or minimum pressures are controlled. The Christensen Company's engineers' valves are used throughout the system.

The exhibit at Boston will be one of the most important of the exposition, and will offer much to study and inspect.

It was a Boston newspaper man out of whose fertile brain the following emanated: "The relation between electric power and the house fly nuisance does not seem apparent, but it is claimed, nevertheless, that the most hopeful sign of the abatement of flies in cities is to be found in the substitution of electricity for horses on the street railways. Practically all flies are bred in stables, it is said, and therefore the fewer stables the fewer flies."



## A NEW FARE REGISTER.

A very interesting little machine and one which is sure to attract much attention at the Boston convention, is a new fare register, the invention of George F. Rooke, of Peoria, Ill. It would seem as if all the possible new ideas and variations in fare registers had been long ago exhausted, but the device which Mr. Rooke has brought out is both simple and in some principal features entirely different from anything yet produced.

It consists of a small, portable, automatic register, carried in the hand of the conductor. When not in use it is conveniently suspended on a bracket attached to a strap, made to go around the neck of the conductor.

In collecting fares the conductor passes the register in front of the passenger, who inserts his fare in the opening at the top. The insertion releases the mechanism, which automatically takes the fare through a slot and deposits it in the palm of the hand that holds the register. The passage of the fare through the register automatically records it, and sounds an alarm, and it is impossible to pass a fare through the chute without registration and ringing the bell. As the fare passes through instantly the conductor has it in his possession at once, in fact as speedily as if the fare had been placed in his hand, and gives him the same opportunity to examine it to guard against bad coin. He then transfers it to his proper change pocket just as he would do with a stationary or the usual portable register.

When collecting, the device is carried in the hand, having a chute running through from top to bottom. It fits comfortably



THE ROOKE FARE REGISTER.

into the hand, so that the lower end of the chute rests on the palm of the hand. In the opening at the top each passenger deposits his fare. While the entrance is open, and when the fare is entered, the releasing mechanism is operated by the coin, by which the entrance of the coin passage is closed, and by the same action the lower end of the chute is opened to allow the coin to fall into the same hand by which the register is held. The operation also causes the recording of the fare and the ringing of a bell. The coin once entered cannot be taken out, but must pass through into the conductor's hand. The closing of the entrance of the coin passage, or chute, after the receipt of each coin, prevents another coin entering until the mechanism is reset by the conductor. The resetting of the device, after the passage of each fare, which is very simply done by the conductor pressing the index finger, puts the register in position for recording each succeeding fare, and at the same time opens the entrance ready for the receipt of the next fare. The machine is so constructed that it cannot be tampered with in any manner without detec-

tion, having a seal attached to the inner construction, the record thus kept by two independent counters being exact, and correctly representing the fares collected. These counters are fastened directly to the mechanism, the figures showing through the openings on either side of the case, same being covered by heavy crystals. They are positively interlocking with the mechanism in such a way that the register cannot be used without tuning



REGISTER IN OPERATION.

the counters, the connections not depending on any springs or ratchets, but being positive in their action.

The machine is not only much smaller than the present portables, but correspondingly lighter to carry, and can be used equally well with either hand, as most convenient. The extreme simplicity of the internal mechanism reduces wear and consequent repairs to a minimum; and continuous and severe tests demonstrate an exceedingly long life for these registers. They will not be sold outright, but leased on reasonable terms.

A strong company has been incorporated to manufacture the machines, and includes some of the best business men in Peoria. C. A. Jamison is president; Arthur Keithley, vice-president; L. Seltzer, secretary; and G. F. Rooke, treasurer and general manager.

Mr. Rooke will have the machines in operation in Exhibit Hall and invites the most critical inspection.

## STRIKE AT SYRACUSE.

At noon on August 5 the employees of the Syracuse (N. Y.) Rapid Transit Company quit work, effectually tying up the road. The strike resulted because the men demanded the recognition of the National Association of Amalgamated Street Railway Employees, which the company would not concede, and because of dissatisfaction with a recent order requiring a deposit of \$25, a physical examination and that conductors carry \$5 worth of Lakeside Railroad tickets (this is a connecting suburban line) for which they must pay. There was also complaint made about the uniform regulations.

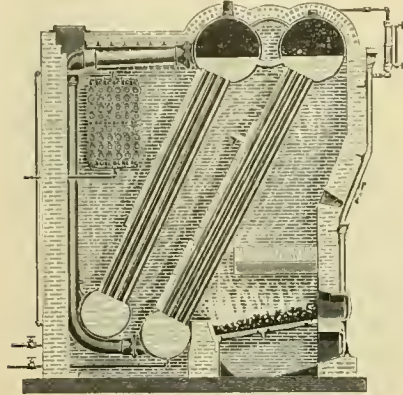
The road was tied up for two days and a half, work being resumed on August 8. The men waived their demand for the recognition of the union, on the company agreeing to receive a committee of the employees; the \$25 deposit rule was rescinded so far as present employees are concerned; the other rules in dispute continue in force.

Robert Pearson, a farm laborer, while driving a hay rack collided with a car on the Metropolitan Street Railway, near Toronto, Ont.; the motorman of the car was badly injured and Pearson was arrested on the charge of "causing grievous bodily injury by wilful misconduct and neglect."

## THE TURNER SAFETY WATER TUBE BOILERS.

The accompanying illustrations show the Turner safety water tube boiler, made by the Turner Engineering Company, of Bucyrus, Ohio. This boiler was designed with the view of getting the highest general efficiency that is possible, having due regard

to cost of attendance, repairs and depreciation, as well as the cost of fuel; and, moreover, to do this in any plant without requiring additional investments for economizing plants and other aids to efficiency. The heating surface is liberal, that is, the boiler rating is on a basis that leaves a large margin for increase of steam production without the efficiency falling off; tests



SECTIONAL VIEW.

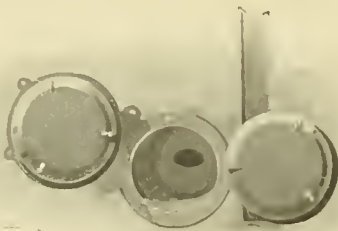
made when the boiler was working 50 per cent above its rating show a drop of only 2½ per cent under the efficiency at rated load.

The sectional view shows the arrangement of the drums, risers, water return, feed heater, etc., as well as the furnace arches and the path of the hot gases. The height and the length of the boiler are the same for all capacities, only the width varying; the drums being of the same diameter, and the tubes and fittings of the same length and diameter, greatly simplifies the building and maintenance.

The upper drums are 40 in. in diameter, with the normal water level a few inches below the center. This gives a large storage capacity for the steam and a large area for the liberation of the steam, which, together with the fact that the escaping steam has to rise through only a shallow body of water, en-



FOR CLEANING TUBES.

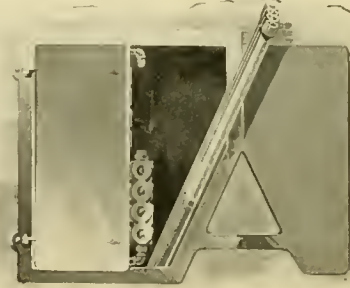


END OF LOWER DRUMS.

dures drier steam than is to be had with many types. The upper surface of the drums also provides large super-heating areas. The

large supply of water which the lower drums give this boiler as compared with header types makes it more capable of responding quickly to sudden increased demands for steam.

The improved circulation is one of the most important features resulting from the design. The upper drums are connected, but the lower ones are not, so that the steam formed in each bank of



SIDE DOOR.

tubes is part of a separate circulation. At the back of the setting is placed a bank of horizontal tubes through which the feed water is forced on its way to the rear lower drum; this heats the feed and reduces the temperature of the flue gases.

As the feed is introduced into the rear one of the lower drums only, the greatest deposit of sediment occurs there and that drum will need to be blown out much more frequently than the forward one. This greatly protects the front bank of tubes, which are exposed to the greater heat, thus keeping their efficiency up over a very long period. Each is provided with a separate blow-off. The drums are all provided with man-holes, so that an attendant may readily get at the tubes to clean them. There are special castings in the side of the setting with holes for introducing a steam pipe for blowing soot from the outside of the tubes.

The good design, high grade material and careful workmanship insure a safe boiler.

## H. W. JOHNS' EXHIBIT AT THE CONVENTION.

The H. W. Johns Manufacturing Company, New York, will have an interesting exhibit of its electrical materials in a space situated near the main entrance to the exhibition room. The company has added new designs to its list of electric car heaters for next season, which will attract the attention of visitors. Other novelties will appear among the samples to be shown of the well-known molded mica insulated trolley line devices and the more recent shapes of "Vulcabeston" repair parts for motors and controllers. The collection of Vulcabeston samples of commutator rings, brush holder bushings and controller parts will afford an excellent opportunity for those interested to note the dissimilarity in the shapes and sizes of these insulating pieces designed by the various manufacturers of electrical apparatus for similar purposes.

During the past year the company has been very successful in selling its all-steel trolley bracket for wood or iron poles and has recently adopted a simple method of providing a certain amount of elasticity or flexibility in the arm for the purpose of counteracting the injurious effects and wear on the car and wire when subjected to the blow dealt by the passing trolley wheel. This will also be on exhibition.

The following representatives of the Johns Company are expected to attend the convention: H. A. Reeves, Chicago; H. C. Spalding, Boston; Messrs. Berry, Craue, S. G. and J. E. Meek, from the New York office, and J. W. Perry, and possibly D. T. Dickson, Philadelphia. There is also a strong probability that Messrs. Hatch and Lucomb, respectively the president and secretary of the Johns-Pratt Company, Hartford, Conn., will be found inside and outside of the company's space, as heretofore.



## ANNUAL MEETING OF "THE SYNDICATE."

The annual meeting of "The Syndicate," an organization of street railway officers and supplymen, was held at Reading, Pa., on Saturday, July 16.

The members and candidates for admission arrived early and were met at the train and escorted to the offices of the railway company. It is stated that a conspiracy was on foot to waylay the treasurer, A. W. Ash, but this was frustrated and Mr. Ash was escorted by a special guard—two of Reading's police force. The Ringgold band was on hand to furnish music.

At noon "The Syndicate" paraded through the principal streets, after which they were entertained at lunch by President Rigg, of the United Traction Company. President Charles Bragg presided as toast master. Harry Carson, William Heulings, Col. Giles Allison, ex-Judge Wylie, of Lebanon, Jacob Wendell, and H. J. Kenfield, of the REVIEW, responded to toasts.

After lunch special cars took the party to Carsonia Park, where they attended the theater. This was followed by a ride about the

Hill & Norristown Railway; R. M. Douglass, general manager Schuylkill Valley Traction Company, Norristown; William Heulings, of the J. G. Brill Company; John H. Yardley, Pennsylvania Car Wheel Company; C. J. Harrington, representing Elmer P. Morris, New York; Robert Randolph, Sterling Arch Light Company, New York; H. J. Kenfield, of the REVIEW.

The newly elected officers are: C. A. Bragg, president; John Graham, Wilkesbarre, vice president; J. A. Rigg, secretary; E. W. Ash, treasurer, and Alvan Markte of Hazleton, chairman of the executive committee.

## EXHIBIT OF FARE REGISTERS.

Among the enterprising manufacturers whose exhibits have in recent years been a feature of the annual conventions of the American Street Railway Association is the New Haven Car Register Company, New Haven, Conn., whose famous "New Haven" fare registers are so widely and favorably known



"THE SYNDICATE," READING, PA., JULY 16, 1898.

city and at 6 p. m. the visitors began to leave for home, all expressing themselves as having had a most enjoyable outing.

The list of those in attendance is as follows: Ralph Moore, of the General Electric Company, Philadelphia; Clifford L. Pullen, of the Philadelphia Car Wheel Works; J. Wendell, of Wendell & MacDuffie, New York; Giles Allison, of the Hildreth Varnish Company, New York; John Grabam, Wilkesbarre; Alvin Markle, Hazleton; E. W. Ash, Girardville; Charles Bragg, of the Westinghouse Electric & Manufacturing Company, Philadelphia; Louis S. Kite, of the Trenton Malleable Iron Company; A. V. Arrow-smith, Reading Electrical Construction Company; G. M. Keim, and F. K. Flood of the Reading & Southwestern Street Railway; John Rigg, president United Traction Company, Reading; S. P. Light and F. E. Meily, Lebanon & Annville Street Railway, Lebanon; C. C. Long, S. E. Riggs and M. C. Aulenbach of the Metropolitan Electric Company, Reading; J. B. Price, Lehigh Traction Company, Hazleton; E. H. Davis, general manager Williamsport Passenger Railway Company, Williamsport; J. W. Perry and William Chapman, of the H. W. Johns Company; J. H. Carson, general manager of the Sterling Supply & Manufacturing Company, New York; J. C. Lugar, general manager Roxborough, Chestnut

throughout the United States and foreign countries. This company advises us that it intends making a complete exhibit of the various styles of single, double and triple registers, embracing all the latest features, at the Boston convention and will exhibit especially a double register intended to check dishonest conductors from turning in transfers instead of the cash fares collected; and also a double register intended for use on cars running over two connecting, but independent lines. Each side of this register is complete and perfectly independent of the other side; each road having its own side of the register which its conductor securely locks upon leaving the car. These registers will undoubtedly attract much attention at the convention as they evidently will meet the needs of a large number of roads throughout the country. The New Haven Car Register Company has been very successful with its machines which have been adopted by a very large number of leading roads and the registers will be found on a large number of roads in the vicinity of Boston and on over 70 per cent of the roads throughout New England, which is certainly a very fine showing. We congratulate the company upon the success it has achieved and extend to it our best wishes for continued prosperity.



### INSPECTION CAR WITH PORTABLE TURN TABLE.

The Detroit Electric Railway Company being designed as a competitor of the Detroit Citizens Street Railway Company with an independent system of tracks covering the same territory as the former, there are many points where the tracks of the two systems cross and no connecting curves are provided. After the Citizens Company commenced operating both systems these crossings proved to be quite an annoyance to the manager, Mr. du Pont, as he made his frequent inspection trips in a special car and could not pass readily from one line to another.

To overcome the difficulty, Mr. du Pont decided to fit his private car with its own turn table, and accordingly securely fastened a hydraulic jack in the center of the truck (a du Pont truck) between the motors. The plunger is 8 in. in diameter and 16 in.



INSPECTION CAR OF GENERAL MANAGER A. B. DU PONT, DETROIT.

### FORT WAYNE DECISION.

The "Fort Wayne (Ind.) Sentinel" of July 13, gives a lengthy abstract of the opinion rendered by the Allen county circuit court in the Fort Wayne Consolidated Electric Railway case, from which we take the following:

Judge O'Rourke completely exonerated Frank Dellaas Robison and severely arraigned John J. Shipherd and the Cleveland bankers for alleged fraudulent misappropriation of bonds and money. Some \$990,000 of bonds now held by the Guardian Trust Company, of New York, and Cleveland banks are ordered held in trust for the railway company. The road is to be sold, but the sale will be delayed as the banks will continue the legal fight.

Mr. Robison has long sought to buy the Fort Wayne Consolidated by paying the actual indebtedness owed, and if this decision is affirmed he will have the opportunity.

### BIG FIRE IN PITTSBURG.

The large car barns, on Franktown avenue, of the Consolidated Traction Company, in Pittsburg, were entirely destroyed by fire in the morning of July 24. There were 35 cars burned, involving a loss of \$50,000, and the value of the building and equipment destroyed amounted to \$80,000 in addition to the cars. All the damage is covered by insurance. The fire probably started in the paint shop, on the second floor. Very little delay in traffic was occasioned, as there were plenty of cars in stock and the Home-wood barn just completed was immediately occupied.

### NEW ELECTRIC LINE AT NEW ORLEANS.

July 16, the first regular electric car was run over the New Orleans City & Lake Railroad (which is operated by the New Orleans Traction Company) to West End on Lake Pontchartrain, the line having previously been operated by steam dummies. Eight double-truck cars, 28-ft. body and 39 ft. over all, made by the Barney & Smith Car Company, were put in service.

The initial trip was made with a car load of prominent citizens who were entertained at luncheon by the company at West End. Nearly all the gentlemen present made short speeches and were unstinted in their praise of the enterprise of General Manager Wyman.

long and has a bell-shaped base 20 in. in diameter. The plunger is held up by a lever, hooked under the side bar of the truck, and close beside the jack is a reservoir capable of holding about seven gallons of oil or water. At the side of the truck and convenient for the operator is a pump 2 in. in diameter by 3 in. stroke. With this pump one man using a 6-ft. lever can easily lift the car in a few strokes. For convenience in carrying, this lever is made up of two 3-ft. pieces which telescope and fit into a socket on the pump. When it is desired to turn the car at an intersection, where the curves do not suit, the car is placed with the plunger in the center of the intersection, the hook holding the plunger is released, and the pump operated till the car is lifted so that all the wheels are clear. The car may then be swung on the plunger as a pivot. When the wheels are over the rails it is desired to run on, the car is lowered by opening a valve between the plunger and the reservoir. The plunger is then lifted and hooked in position and the car is ready to be started. The whole operation requires only about a minute, so that regular cars need not be held.

The illustration shows the car as lifted for swinging.

The Citizens' Traction Company, of Oshkosh, Wis., has been adding new attractions to its park at Lake Winnebago. Music has been provided on Sundays, a new bath house has been opened and a number of hot air balloons have been sent up with several dollars worth of street car tickets attached.



## NEW PUBLICATIONS.

"Electricity for Machine Driving" is the title of an interesting pamphlet by the Westinghouse Electric & Manufacturing Company, in which are given some of the reasons why electricity should replace belts for machine shop distribution.

The Babcock & Wilcox Company has just issued the thirtieth edition of its book "Steam". This book has been for years one of the standard works on water tube steam boilers and on boiler practice generally. The present edition contains much new matter. It is beautifully printed and illustrated and substantially bound, and is sent free to anyone in any way interested in the generation of steam.

"Through the Garden of Canada" is the title of a publication by the Hamilton, Grimsby & Beamsville Electric Railway Company, and the views of the beautiful vineyards and orchards in Ontario near which the interurban road runs certainly justify such a heading. Photographs are shown of the cars, power house and line of the company. The cars are especially noteworthy for their large size, comfort and finish. A. J. Nelles is the manager of this prosperous system.

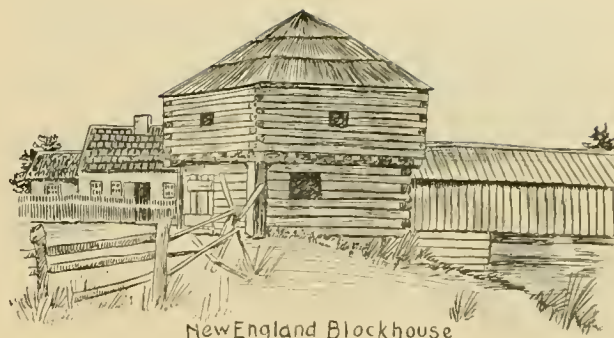
The 21st edition of Duncan's Manual of Tramways, Omnibuses & Electric Railways has been received. This is a volume of 400 pages containing abstracts of the accounts of 136 home (United Kingdom) and 37 foreign companies in which English investors are largely interested. In addition is a directory of the directors, officials, firms and individuals connected with these companies; extracts from the Tramways Act and By-Laws are also given. Published by T. J. Whiting & Sons, Ltd., 7a South place, London, E. C. Price, 3s. 6d.

We have received from the publishers, Baudry & Co., Paris, "La Traction Electrique," by André Blondel, professor of electricity in the School of Bridges and Roads, and F. Paul-Dubois of the Paris Municipal Service, and shall publish an extended notice of it in a future issue. This is the most complete treatise on the subject that has come under our observation; it comprises two volumes, large octavo, and contains over 1,700 pages with 1,014 illustrations. Price: 50 francs (\$10).

A catalog, illustrating and describing the "American" fuel economizer, has been issued by Broomell, Schmidt & Co. It is very complete and clearly sets forth the advantages of the economizer, with particular reference to the Broomell and Burpee patents which are used in the manufacture of this economizer. It is claimed that by heating the water from the waste gases, purifying the water, and preventing scale from forming in the boiler tubes a saving of from 10 to 20 per cent can be effected in the coal pile. A complete system of fans and engines for producing mechanical induced draft is also manufactured by this company.

The annual "Souvenir of Binghamton", published by the Binghamton Railroad Company in the interest of the city and incidentally to stimulate street railway traffic, is more pretentious this year than anything attempted before. Half-tone views are given of the principal public and private buildings, churches, residences, and of the various interesting features of the railway system. One plate gives an excellent likeness of President Rogers, Treasurer Rogers and General Manager J. P. E. Clark, to whom much credit is due for the fine street railway service of the city. The souvenir is a model of its kind and the workmanship is of the best.

The Milwaukee Electric Railway & Light Company has issued an attractive pamphlet entitled "Scenic Trolley Rides" which is full of interesting information concerning Milwaukee and towns and cities connected by electric railway to the metropolis. Views of many of the details of electric railway operation, the business districts, public buildings, large manufacturing plants, residences, pleasure grounds and parks are interspersed among reading matter in a very artistic manner. A large insert gives a



New England Blockhouse

bird's eye view of Milwaukee and the lake region of southeastern Wisconsin. The contents were compiled by O. M. Rau, electrician of the company.

An extremely valuable and instructive work for Americans and Japanese who are interested in both languages is the new and second edition of the Standard Verbalist, edited and published by W. Araki, Osaka, Japan. The work comprises two volumes, one devoted to commercial, the other to conversational terms, giving all the words, phrases and sentences most commonly used. The two volumes comprise some 300 pages and contain several thousand terms and idioms. The Japanese equivalents are printed opposite the American expressions. Mr. Araki, who is a personal friend of the editor of this publication, is a young man of great promise, and a fine linguist. He has served his government most acceptably in various commissions, including interpretation during the making of the peace treaty between his government and China, and afterward on a mission to this country collecting data and mechanical exhibits for the National Museum at Tokio. He is highly qualified for the work he has undertaken, and has rendered a signal service in his new book.

It is expected that the Easton, Palmer & Bethlehem electric railway, 12 miles in length and connecting the cities of Bethlehem, Pa., and Easton, will be in operation by September 15.

The government has granted a right of way across the Pike's Peak reservation to the Colorado Springs-Cripple Creek Electric Railway Company. The work on the electric road which will connect the two cities will be pushed to completion.

The Albany, Helderberg & Schoharie Railway Company has been reorganized, and the following officers elected: President, W. H. Burgett, of Boston, in place of John W. Van Valkenburgh; directors, R. Schermerhorn, of Brooklyn, in place of Jacob Keleh, of Gallupville; C. E. Bibber, of Boston, in place of Mr. Loucks, of Bethlehem; Herbert Smith, of Boston, in place of F. C. Hnyek; Charles F. Perkins, of Boston, in place of Harrison Finkle, of Reusselaer.

Very peculiar methods are sometimes employed to obstruct the construction of trolley lines, and the North Jersey Street Railway Company had a recent experience. A grocer in Montclair objected to a trolley pole being planted in front of his store. When the hole was dug he hired a man to jump into it and paid him a dollar an hour to stay there. The construction boss coaxed and threatened him to no avail and finally paid him \$10 to get out, and the pole was set.

The Connecticut farmers in the vicinity of Hartford appreciate what it means to have a trolley line service. As it has been difficult to obtain a franchise along the country roads many of the farmers are offering rights of way across their fields to the traction companies. These shrewd Yankees understand that the trolley car means not only a cheap, quick and frequent passenger service to the city but also facilities for sending eggs, butter, milk and vegetables to market.



Boston in 1790

## PERSONAL.

J. M. Blatt, of Cleveland, has been appointed superintendent of the Milwaukee, Racine & Kenosha Electric Railway.

J. D. R. Baldwin, of New York, has been chosen president of the General Electric Railway Company, Chicago.

Robert Jordan, a nephew of Mr. Sutro, has been appointed superintendent of the Sutro Railroad, San Francisco.

James Butler has been made general superintendent of the Bridgeport (Conn.) Traction Company.

Robert Miller, superintendent of the Springfield (Mass.) Street Railway Company, has resigned because of ill health.

Robert T. Lee, of Newport, R. I., has assumed his duties as superintendent of the Springfield (Mass.) Street Railway Company.

Charles F. Uebelacker, engineer and assistant manager of the Peckham Motor Truck & Wheel Company, was a REVIEW caller last month.

Thomas H. McLean, general manager of the Toledo Traction Company, called on the REVIEW a few days ago while in Chicago on business.

J. C. Hale has been appointed assistant superintendent of the Milford (Mass.), Holliston & Framingham Street Railway to succeed H. E. Reed.

G. A. Loring has been appointed superintendent of the San Francisco & San Mateo Electric Railway, to succeed S. B. McLenegan, resigned.

A. R. Hallowell has resigned as superintendent of the Gloucester (Mass.) Street Railway Company; his successor is Mr. Reed, formerly of Allstone.

W. H. Foss, until recently an inspector for the Biddeford & Saco electric line, has been appointed superintendent of the new road at Webster, Mass.

Eugene Klapp, for some years of the engineering department of the Alley L. Chicago, is second lieutenant in the second volunteer infantry, now at Fort Sheridan.

E. E. Downs, manager of the Oshkosh (Wis.) Street Railroad Company, and Harry I. Weed, attorney for the company, called on the REVIEW when in Chicago recently.

Charles Lahuer has been appointed assistant superintendent of the Chippewa Electric Railway Company, Eau Claire, Wis.; he has been with the company for 11 years.

E. F. Hebard, formerly connected with the Consolidated Traction Company, of Jersey City, has been chosen general manager of the Dayton & Miami Valley Traction Company.

W. W. Annable, superintendent of the street railway machine shops at Grand Rapids, Mich., is the inventor of a chainless bicycle now being made by a Grand Rapids firm for the season of 1899.

G. P. Paul, manager of the Ottawa (Ill.) Street Railway Company, has resigned his office to accept a position in St. Louis. He has done much for the railway system and service in that city.

W. A. Clayton, secretary of the San Francisco & San Mateo Electric Railway, has been made the chief executive officer under the supervision of the vice-president and general manager, J. A. Buck.

President Dyer, of the Augusta, Ga., road, had started for Cuba at the time of the death of his auditor and assistant, Mr. Reavis, but turned back just as he was about to sail from New York.

Isaac N. Thomas, of Wilkesbarre, Pa., has been chosen president of the Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Company, to succeed W. S. Grant, Jr., who resigned recently.

J. R. Carrier, of Boston, has been appointed superintendent of transportation of the Syracuse (N. Y.) Rapid Transit Railway Company. This is a new office made necessary by the increase in traffic.

Chester P. Wilson, who has been general manager of the Sioux City Traction Company for several years, resigned on July 9. He returned to the east and it is stated will soon go to Eu rope to engage in business.

N. B. Kellogg, formerly chief engineer of the power station of the Syracuse (N. Y.) Rapid Transit Company, resigned last month; before leaving he was presented with a scarfpin and watch charm by his associates.

W. M. Tuohy, of Butte, Mont., has been appointed general manager of the Electric Railway, Light & Power Company, of Anaconda, succeeding John S. McGroarty. This property is controlled by the Anaconda Copper Mining Company.

E. F. Chapman, superintendent of the Zanesville (O.) Railway & Electric Company, has resigned to engage in telephone work in Cleveland. C. W. Foote, general manager of the Citizens' Traction Company, San Diego, Cal., will succeed Mr. Chapman.

W. G. Wagenhals resigned as general manager of the Cincinnati & Miami Valley Traction Company on August 3, and will devote himself to a number of personal enterprises, among them that of developing electric traction on the Miami & Erie canal.

A. L. Stone has resigned as secretary of the Oakland, San Leandro & Haywards Railway Company and the directors have chosen S. B. McLenegan, formerly superintendent of the San Francisco & San Mateo Electric Railway Company, to fill the vacancy.

Marcellus Hopkins, general manager of the South Side Elevated, Chicago, was injured on July 28, while inspecting the tracks. He was caught between passing trains on a curve and buffeted between them, receiving a severe scalp wound and several bruises.

Ichisuke Fujioka, consulting engineer of the Tokio Electric Railway Company and several other electrical companies in Japan, sailed on the Campania, July 16. Mr. Fujioka has been in America several months and will spend some time in Europe before returning home.

Officers of the Orange & Passaic Valley Railroad Company, the new owner of the Suburban Traction Company, Orange, N. J., have been chosen as follows: President, Col. Charles A. Sterling; vice-president, William Scherrer; secretary and treasurer, John H. Ely. Mr. Ely will also be general manager.



R. M. Douglass, general manager of the Schuylkill Traction Company, had his hand lacerated in an accident at Norristown, Pa., July 25. While taking a construction car loaded with poles down a steep grade the brakes on the motor car failed to hold, and a runaway resulted; the cars left the track and struck a wagon and team. One of the men in addition to Mr. Douglass was severely injured.

Frank M. Byron, for several years past city passenger agent of the Lake Shore road in Chicago, has been appointed general western passenger agent to fill the vacancy caused by the death of Cyrus K. Wilber. Mr. Byron has a large acquaintance among street railway officials in the west, who remember him most pleasantly in connection with their trips to conventions, and will be gratified at this recognition of his ability.

### OBITUARY.

William H. Blood, division superintendent of the Brooklyn Heights Railroad Company, died at his home in Brooklyn after suffering from diabetes. He has long been engaged in railroad and railway work.

J. H. Rafferty, secretary of the Waterloo & Cedar Falls Rapid Transit Company, died at Waterloo, Ia., on July 20, after a brief illness. He was prominent in the business affairs of that section of the state, and at the time of his death he was promoting an electric railway from Manchester to Colesburg.

C. O. Richardson, the pioneer street railway builder in Worcester, Mass., died from a stroke of apoplexy at the age of 65 years. He was a man of large business interests and had accumulated a comfortable fortune as a street railway builder and a paving contractor. Mr. Richardson belonged to many religious, social and benevolent organizations and was very charitable.

### SHORTEST TROLLEY LINE ON RECORD.

The San Francisco & San Mateo Electric Railway Company was asked to build a branch line from its road to Mount Olivet Cemetery, but declined to do so. The directors of the Cemetery Association then decided to organize a railway company. The work on the line, which is to be 2,500 ft. in length, has commenced and will be completed in four weeks. One car will be sufficient to carry the traffic and it will run between 8 a. m. and 6 p. m. A transfer system has been arranged with the San Mateo company.

### A GOOD ANNUAL REPORT.

The yearly meeting of the directors of the Pittsburg & Birmingham Traction Company was held in Pittsburg on August 9. The report compiled by Secretary Rogers showed that during the year 8,612,027 passengers were carried, and the operating expenses were 39.56 per cent of gross receipts, or 9.31 cents per car-mile; \$30,000 was paid out in dividends and a surplus of \$23,634 was left from the year's operation. The old officers were re-elected.

### SPEED IN BINGHAMTON, N. Y.

July 19 the common council of Binghamton, N. Y., passed an ordinance fixing the maximum speed of electric cars in the city at six miles per hour on bridges, nine miles in the central portion of the city, and 12 miles elsewhere. The preamble stated that the old ordinance, in force since 1894, "has been demonstrated by experience to be impracticable and unworkable, not meeting the requirements of the traveling public and not consistent with the demand for reasonable and safe rapid transit."

On July 30, 200 members of the Third Avenue Railway Employees' Mutual Relief Association had a bicycle parade; the procession was led by a squad of bicycle police and a band.

### PLOWING UP MACADAM PAVEMENT.

Until a few weeks ago 35th street between Michigan avenue and Grand boulevard, a distance a trifle more than one-quarter of a mile, was a part of the South Park system of Chicago, and the Chicago City Railway was therefore prevented from having a through cross line on this street. Satisfactory arrangements were made, however, and the South Park Board vacated 35th street and accepted 33rd street for the connecting link between the two boulevards.

The railway company at once proceeded to lay its tracks, quick work being desirable because some opposition was developed among the owners of the abutting property. The contract was



PAVEMENT PLOW.

let to Clift Wise, who pushed the work rapidly, employing a force of 200 men.

The old roadbed consisted of 14 in. of blast-furnace slag, on which was Joliet gravel with a top dressing of broken stone, making the whole 20 in. deep; having been in service for several years it was very hard. This had to be taken out to a depth of 14 in. for the width of double tracks, and for this work four pavement plows, or, as they are called by the men, "go-devils," were used, thereby reducing the force needed by several hundred men. The "go-devil" is a pointed plow, as shown in the illustration; on the beam is a shoe which, sliding on the ground, sets a limit to the depth of the cut. On this work eight horses were used to each plow, four abreast at the plow and two teams tandem in front of these four. A crew of 10 men is required, three at the handles, three to hold down the beam, and four drivers.

The tracks were laid with 90-lb. grooved girder rail.

### HIS REPORT.

The following is from a motorman's report, as sent to his superintendent, in explanation of an accident. It is a good sample of many such: "I was running my car down First street at a fair rate of speed and had the car in good control, when the man rushed out from the sidewalk and jambed his head into my car."

### MAMMOTH FOREIGN ORDER FOR WALKER COMPANY.

The Walker Company has an order from its Paris agents, "Exploitation des Procédés Electriques Walker," for 500 electric street car equipments, 1,000 motors, 1,000 controllers, 500 trolleys, and details. It amounts to over \$500,000 and is one of the largest single orders ever received; the apparatus will go to various parts of Europe.



FRANKLIN'S BIRTHPLACE, BOSTON, 1706.

## WESTINGHOUSE FOREIGN ORDERS.

A shipment of engines and generators is being made to the Metropolitan Supply Company, of London, by the Westinghouse Machine Company, and the Westinghouse Electric & Manufacturing Company. Each of the three engines has a capacity of 2,500 h. p. and is of the vertical compound marine type and weighs 210 tons. Direct connected to each engine will be a two phase alternator delivering current at 500 volts. The efficiency at full load is calculated to be 95 per cent. At the end of each



WESTINGHOUSE 2,500-H. P. ENGINE FOR LONDON.

engine shaft will be a direct connected direct current multipolar exciter to furnish current for the fields.

The Westinghouse Machine Company is doing a large gas engine business and the engines, ranging from 10 to 200 h. p., are giving great satisfaction. An engine of 700 h. p. which is the largest in the world has recently been completed. The engine in tests has developed a brake horse power on 11 cu. ft. of natural gas.

This company has also made arrangements for the manufacture of the Parsons steam turbine. One has been built and is operating a 200-h. p. alternator at the company's plant.

Frank Riedle, of Chicago, one of the promoters of the Michigan City (Ind.) electric line has failed and the Chicago Title and Trust Company was appointed receiver. Mr. Riedle is a real estate dealer and is said to be worth \$75,000.

## THREE-PHASE TRAMWAYS IN ENGLAND.

(From Our Own Correspondent)

The greatest interest is being taken in this country in an extensive system of electric tramways which has just been opened to the public. The line connects three very important districts in the North of England, and the plant that has been erected possesses more than usual interest because it constitutes the first system in which three-phase generators, with rotary converters, have been adopted in this country. It is true that the Dublin & Clontarf lines have been for some time operated on the three-phase system, but in this case motor generators were employed, and to English engineers that purely American product, the rotary converter, is entirely new. The line is not more than 6½ miles in length, and the track is double for the greater part of its length.

There is a very special reason why three-phase apparatus has been adopted: the Board of Trade insists that the fall in potential in the return shall not exceed 7 volts, and it is obvious that with a considerable number of cars working on a line this would be greatly exceeded if special arrangements were not made to overcome it. Near one end of the line, therefore, a three-phase generating plant has been erected and a high pressure current of 2,500 volts is conveyed by separate mains to two sub-stations in which rotary converters feed into the line at a voltage of 500. From beginning to end the whole of the plant is American, the central power house is occupied by three three-phase alternators, each of 300 k. w. capacity, running at a frequency of 25 cycles of 94 revolutions per minute. The engines are of the Reynolds-Corliss horizontal cross-compound condensing type, of 400 h. p., made by E. P. Allis & Co., of Milwaukee, and the generators have been supplied by the British Thomson-Houston Company, and made in America by the General Electric Company. The fields of the alternators are excited from the 500-volt bus bars. To supply light to the engine room and to start work in the morning a battery of the Tudor type has been supplied, consisting of 260 cells. For charging the accumulators a booster is connected in series with the 500-volt bus bars.

In addition to enabling the system to conform to the Board of Trade regulations, the three-phase distribution has enabled the promoters to avail themselves of a suitable site where water and fuel were easily obtainable.

The feeder cable which transmits the three-phase current from the central power house to the sub-station consists of two concentric cables, in each of which are three conductors of copper, suitably insulated, each copper conductor having an area of 50 sq. mm., or .0775 sq. in. The current at the sub-station is reduced by step-down transformers of 80 k. w. capacity to 320 volts, and this current is then passed into the alternating current side of a rotary converter from which a direct current of 500 volts is drawn to feed that portion of the line supplied from the sub-station. That section of the line contiguous to the main generating station is supplied by two four-pole rotary converters of 200 k. w. capacity, running at 750 r. p. m. A novel feature of the main station equipment, as far as English practice is concerned, is a combination of the static and rotary transformers for charging the batteries. The charging current is passed through the rotary and the voltage raised from the line average, 500 volts, to a maximum of 650 volts for charging.

There being no direct current primary generator in the station, it became a problem how to charge the batteries for supplying exciting current for the high tension three-phase generators. This was solved in the following manner: A rotary converter was designed to supply the difference between the line voltage and the variable voltage required for charging, and combined with this is a static transformer having a ratio of transmission of 330 to 80 volts. The transformer was designed with a large amount of leakage between the primary and secondary conductors, the leakage being adjusted so that by changing the phase of the armature current by a variation of the field current of the booster the transformer ratio is varied, and consequently the voltage on the collector rings. In this way it is possible to vary the voltage on the continuous side of the rotary from 40 volts to 150, the charging current being 60 amperes.

The steam raising plant in the main power house consists of



three Babcock & Wilcox water-tube boilers and these are equipped with a mechanical stoker worked by an electric motor. The power house being erected close to the river Tees, coal is taken direct from the barges by electric hoists provided with an automatic grab and is discharged into a receiving hopper where it is weighed, being then taken by a conveyor and carried to the storage bunkers inside the station. The most interesting feature to English engineers in the construction of the system has been the rapidity with which the outside work has been carried on and it will no doubt have a very marked effect upon new systems. It must be interesting even to American engineers, who are remarkable for the rapidity with which they equip lines for electric working. The Royal assent to the construction of the Middleborough lines was given on the 5th of August, last year, ground was broken for the new line at the Norton terminus on September 1, last, but so rapidly was the work carried on that the entire permanent way of 15 miles of track was completed in less than six months. This reduced the interruption of the general traffic on the streets to a minimum and actually within 18 months of the completion of the negotiations with the local authorities the lines have been opened in full working order. It need hardly be pointed out that matters as a rule move so slowly in this country that the period between consulting the local authorities and finishing the system is usually three years.

The tracks are laid on a gage of 3 ft. 6 in., and are paved with Winstone and granite in some parts of the system, and with scoria blocks in the town of Middleborough.

The progress of the work was viewed with the greatest interest by the community, and as six gangs, of 70 to 100 men were working at one time on the line, the scene was generally an animated one. The first process was to remove the old tramway line and to clear out to the required depth of 14 in. the breadth of roadway to be used. Following in every case the excavating squad, came the concreters, who laid down a solid foundation 6 in. deep of Portland concrete. Concrete laid to level was then ready for the platelayers, who proceeded to the actual track laying.

The steel rails in 36-ft. lengths are 6-in. girders of 92½ lbs. to the yard. At every 10 ft. the rails are tied to gage by steel bars; the joints are secured by specially designed fishplates. The bonding throughout is done by means of Columbia bonds and at intervals of 120 ft. the tracks are further cross-connected by copper.

The gradients generally are easy, but one or two sections are fairly severe, one portion being 1 in 18. In the towns the overhead wire is suspended by center poles, the remainder of the route being fitted on the side pole and bracket system. The overhead wire is of 000 gage, divided by the usual section insulators. Half-mile section pillars are arranged and in these are placed switches so it is possible to cut out a section of trolley line or feeder as may be desired without interfering with other parts of the line.

The cars have been specially designed in America for this service, and are each capable of seating 60 passengers. They are mounted on four-wheeled bogey trucks and each truck carries a G. E. 800 motor, and at each end of the car is a K2 series parallel controller.

The whole of the system has been designed by H. F. Parshall, of the British Thomson-Houston Company. The system is owned by the Imperial Tramways Company, the managing director of which is J. Clifton Robinson, whose pioneering work in electric traction I have referred to on former occasions. This gentleman has not only been responsible for importing the best electrical plants from America, but he has brought over from the United States methods which cannot help but have the greatest effect upon the successful initiation of electric tramway enterprise in this country. It is claimed, apparently with reason, that this tramway system is the most complete that has been erected in this country and it will serve as a model for future lines.

A correspondent advises us that for weeks past the American flag and the Union Jack have been floating side by side on the power house of the new electric railway at Thornaby-on-Tees, England.

## THE GRAB-HANDLE MAN AGAIN.

THE STATEN ISLAND MIDLAND RAILROAD CO.

STAPLETON, STATEN ISLAND, N. Y., July 15, 1898.

EDITOR STREET RAILWAY REVIEW:

Thinking you will be interested in knowing when you are of service to your subscribers, I write to inform you of a fake case of damages tried on us only yesterday.

The man making the claim had his arm done up in a sling, and had it bandaged so tight that it was purple. One leg was also bandaged up in the same way. He claimed that in alighting from one of our cars the grip handle pulled off, and was the cause of his falling off the car with such force as to result in these injuries.

The face of the man seemed familiar; we kept studying it, trying to make up our minds where we had seen it, and finally remembered a similar grip handle accident case, which was exposed in one of your issues; and, upon referring to the back numbers of the REVIEW, we found, in the September issue of 1897, on page 559, the picture of the man. We thus identified him and were kept from being imposed upon.



AUGUST KRAUSE, alias JOHN CRAMER, alias JOHN MILLER, alias JOHN SCHAEFFER.

We started out to get a police officer to put the man under arrest, but before we could get hold of one the man had taken to his heels and run.

John seems to be a favorite name of his, as I notice that he nearly always gives his first name as John; this time he gave it as John Schaeffer. It would seem that this man would stop trying this same kind of blackmail, having been caught now four times. Yours truly,

W. B. ROCKWELL, President.

(As this man is still pursuing his swindle we feel justified in again publishing his portrait, which appeared in the REVIEW for September, 1897.—Ed.)

## CORRESPONDENCE.

CHESTER TRACTION CO.

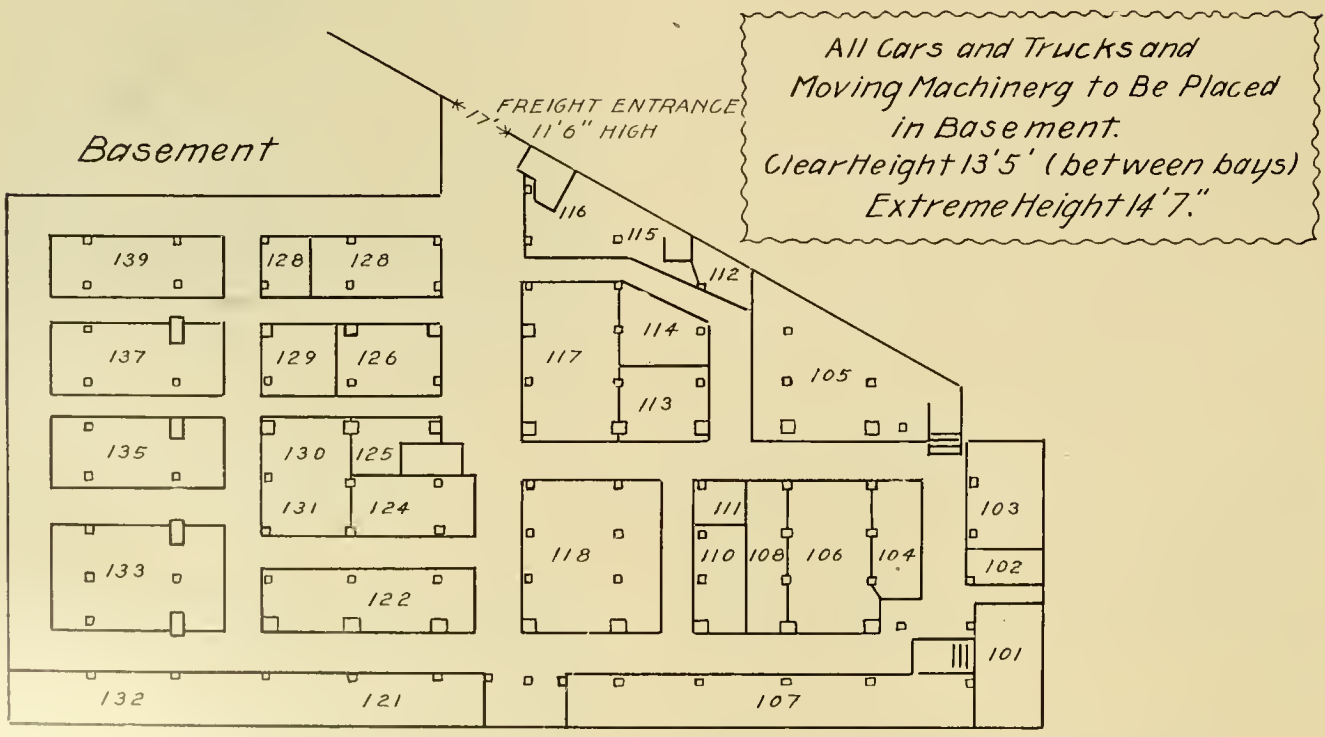
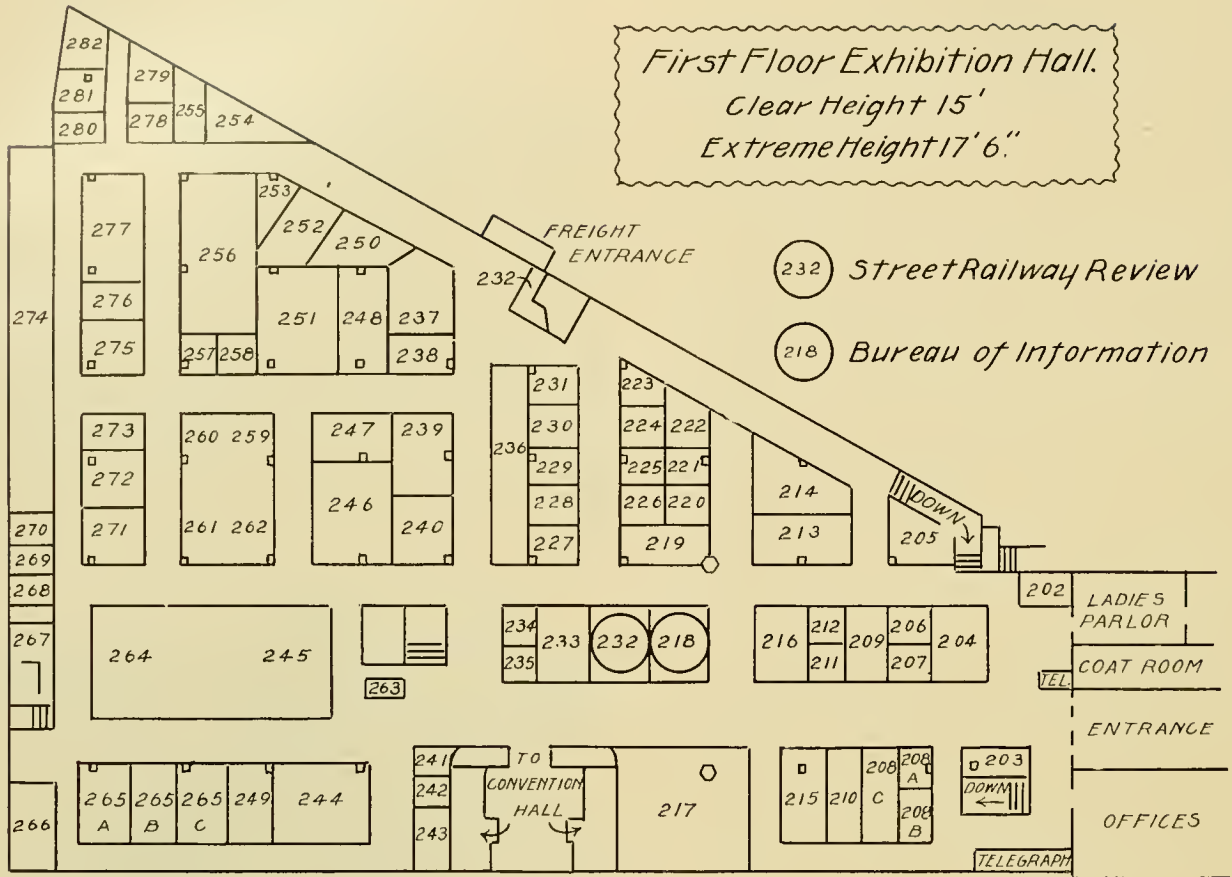
CHESTER, PA., July 30, 1898.

EDITOR REVIEW:

Regarding the application blanks used by our company, and published in the July REVIEW, I desire to state that I do not wish to claim any credit whatever for originating these very efficient blanks.

I understand that they were got up by Robert F. Fox for use by the Scranton Railway Company, of which he was at that time the general superintendent, but has since become general manager of the Wilmington and Chester Railway and Traction Companies.

JOHN MACFAYDEN, Superintendent.





## LIST OF EXHIBITORS AT THE BOSTON CONVENTION.

BASEMENT.		
Space No.	Name.	Sq. Ft.
102	McCardell, West & Co.	220
103	Rochester Car Wheel Works	600
104	New York Car Wheel Works	400
105	Taunton Locomotive Mfg. Co.	1450
106	Laconia Car Company	819
107	Peckham Motor Truck & Wheel Co.	1500
108	Barney & Smith Car Co.	429
110	Briggs Carriage Co.	360
111	James L. Kimball	108
112	Graham Equipment Co.	100
113	Wells & French Co.	414
117	McGuire Mfg. Co.	920
118	J. G. Brill Co.	1248
121	Walker Co.	1450
122	Taylor Electric Truck Co.	853
124	Pennsylvania Car Wheel Co.	420
126	Hampden Corundum Wheel Co.	416
127	Springfield Mfg. Co.	300
131	Baltimore Car Wheel Co.	140
132	Walker Co.	.....
133	The Johnson Co.	1155
135	The Johnson Co.	480
FIRST FLOOR.		
203	Sampson Cordage Works	100
204	Ohio Brass Co.	300
205	New Haven Car Register Co.	225+50
206	Corning Brake Shoe Co.	100
207	Ashton Valve Co.	100
208A	Ham Sand Box Co.	100
208B	Wadsworth, Howland & Co.	100
208C	American Safety Tread Co.	100
208D	C. W. Trainer Mfg. Co.	100
209	Craghead Engineering Co.	200
210A	A. O. Norton	100
210B	Forsyth Bros. Co.	100
211	American Railway Supply Co.	100
212	Adam Cook's Sons	100
213	Pantasote Company	264
214	Thayer & Co., Incorp.	350
215	Albert & J. M. Anderson Mfg. Co.	240
216	H. W. Johns Mfg. Co.	300
217	Westinghouse Elec. & Mfg. Co.	1024
218	Bureau of Information	280
219	Harold P. Brown	200
220	F. H. Newcomb	100
221	W. T. Van Dorn Co.	100
222	Falk Manufacturing Co.	150
223	Frederick C. McLewis	110
224	Beverly Machine Works	100
225	Boardman Tucker Co.	100
226	Stanley & Miles	100
227	J. T. McRoy	100
228	Standard Underground Cable Co.	100
229	Pearson Jack Co.	100
230	The Wagner Electric Mfg. Co.	100
231A	E. F. Dewitt & Co.	100
232	STREET RAILWAY REVIEW	300
233	Street Railway Journal	300
234	Railway World	120
235	Electrical Review Publishing Co.	120
236	Ornamite Veneer Co.	550
237	Pennsylvania Steel Co.	336
238	Weber Railway Joint Mfg. Co.	120
239	The Adams Westlake Co.	350
240	Bibber-White Co.	182
241	C. F. Orr & Co.	100
243	William F. Ellis	200
244	Pettingell, Andrews & Co.	402
245	General Electric Co.	1653

246	Consolidated Car Fender Co.	497
247	Christensen Engineering Co.	263
248	Barbour, Stockwell Co.	318
249	Billings & Spencer Co.	200
250	Sherburne & Co.	530
251	Wm. Wharton, Jr., & Co., Inc.	503
252	See 250.	
253	See 250.	
256	Cleveland Frog & Crossing Co.	800
257	Cambria Iron Co.	100
258	American Rail Joint & Mfg. Co.	100
259	Van Wagoner & Williams Hardware Co.	218
260	International Register Co.	218
261	Frank Ridlon Co.	218
262	R. D. Nuttall Company	218
263	John Stephenson Co., Ltd.	100
265A	Consolidated Car Heating Co.	200
265B	Heyward Bros. & Wakefield Co.	200
265C	Boston Artificial Leather Co.	200
266	Burdett & Johnson	180
268	Crosby Steam Gage & Valve Co.	100
269	R. Woodman Mfg. & Supply Co.	100
270	Columbia Machine Works	100
271	Charles Scott Spring Co.	210
272	Pratt & Letchworth Co.	210
273	E. T. Burrows Co.	150
274	Elmer Morris	1080
275	Meaker Mfg. Co.	200
277	Sterling Supply & Mfg. Co.	400
278	William Tauss Rail Joint	100
280	John F. Ohmer	100
281	J. A. Lakin & Co.	100

### THE BUREAU OF INFORMATION.

One of the important departments of the Convention will be the Bureau of Information, arranged for by the Committee on Transportation and Information.

This will be in charge of Robert H. Derrah, of the Boston Elevated Railway Company, whose knowledge gained in preparing the Derrah's Street Railway Guide to Eastern Massachusetts, will be found especially useful. A space containing some 240 sq. ft. has been reserved for the information booth, and this will be handsomely fitted up with rugs and furniture, with writing materials, etc., for the use of delegates and street railway men. In the booth will be a library of guide books, not only of Boston, but of Concord, Lexington, Plymouth and other places which many of the delegates will wish to visit. There



R. H. DERRAH.

will also be a case containing folders of all the railroad companies, with maps of Boston and surrounding cities. A special telephone will be put in this booth, in addition to that in the main building, so that if any delegate wishes information which cannot be furnished by those in the booth, they will soon be able to supply the want. This is the first time in the history of the Association that anything of the kind has been provided, and it is believed that the Bureau of Information will prove one of the valuable features of the Boston Convention.

Another road which started out full of promises and ambition to achieve success with a 4-cent fare is filled with sorrow and regret, and is imploring the city council for relief from conditions which it voluntarily assumed. For each 5-cent fare a check was given the passenger, and five of these checks were exchangeable for another ride. Now when transfers and improved service are desirable and demanded, the company finds itself unable to comply.

## BOSTON TRADE NOTES.

Meaker fare registers will be noticed in the cars of the Lynn & Boston road.

The Barney & Smith Car Company has 90 of its closed motor car bodies and 48 of its class G trucks on the Boston road.

McCardell, West & Co., Trenton, N. J., have one of their Trenton trolley wagons in service on the West End road.

The Crane Company, of Chicago, has a large number of its valves in the different power houses of the Boston Elevated.

S. D. Childs & Co., of 140-142 Monroe street, Chicago, furnish all the badges used by the West End Street Railway Company.

The Mica Insulator Company advises that its products have been furnished to the Boston roads and have given the best of satisfaction in every instance.

All the winter cars of all the roads in and around Boston have been equipped with the "Reliable" track cleaner, made by the Van Dorn & Dutton Company, Cleveland.

The Standard Underground Cable Company, of Pittsburg, has furnished a very considerable portion of the 230 miles of the feeder cables laid by the Boston Elevated.

An order for plastic rail bonds, made by Harold P. Brown, has been filled for the Boston Elevated Railway Company after the bonds had been subjected to a careful test.

The Dayton Manufacturing Company, Dayton, O., furnished all of the brass trimmings in 90 of the West End cars which were built by the Barney & Smith Car Company.

The Boston Elevated has 33 of the Taunton double track snow plows; and the Lowell & Suburban five. Taunton plows will also be found on the Wakefield & Stoneham road.

The Boston Elevated has a large number of the Q & C portable rail-sawing machines in use, and also some of the large power machines for rail cutting in the repair shops.

The Lynn & Boston Railway Company has adopted the Peckham "extra long" truck as the standard and has about 200 in operation. The West End also has Peckham trucks under some of its cars.

In the various power stations of the West End system there are Green fuel economizers aggregating over 6,000 h. p.; those in the Harvard station are fitted with the latest improved circulating valves.

Both the Boston Elevated and the Commonwealth Avenue companies have been extensive customers of the R. D. Nuttall Company, and have a large number of its trolleys, gears and pinions in use.

The Siemens & Halske Electric Company has manufactured dynamos and motors for the Boston Public Library, City Hospital, Massachusetts Charitable Mechanic Association and other private corporations in the city.

Almost without exception the electrical apparatus in the power houses of the Boston Elevated Railway Company was made by the General Electric Company. There are also a large number of General Electric motors on the Boston cars.

The Partridge Carbon Company will be represented at the convention by its secretary, J. S. Speer, who will exhibit a line of self lubricating motor and generator brushes and will gladly explain their many virtues to the visiting street railway men.

The Michigan Pipe Company has filled large orders for creosoted wood conduit to the New England Telephone & Telegraph Company for the underground cables in Boston.

A. G. Hathaway, of Cleveland, O., has furnished the West End road, Boston, with 27 single and two double Hathaway patented transfer tables; the Lynn & Boston and the Quincy & Boston have each two single tables and the Newton & Boston one.

Over 3,000 transfer ticket punches have been furnished to the Boston Elevated Railway Company by the R. Woodman Manufacturing & Supply Company. Large orders for these punches have been filled for the Lynn & Boston and other street railways about the city.

The John Stephenson Company has built cars for the street railways in Boston from the earliest horse car days to the present time. During this last spring an order for 30 standard 25-ft. closed cars was filled by this company for the Boston Elevated Railway Company.

The Crouse-Hinds Electric Company, of Syracuse, N. Y., has its "Syracuse" changeable electric headlight in service on several of the roads running out of and near Boston. This light is reliable, neat in appearance, efficient, costs nothing for maintenance and is very convenient to handle.

Elmer Chickering, who is the official photographer for the Mechanics' Fair, will have headquarters in the Mechanics' Building during the Street Railway Convention. He is one of the best photographers in Boston and will be glad to do the photographic work for the street railway men and exhibitors.

Two of the new geared axle-driven air brake equipments of the Standard Air Brake Company are in use on cars of the Commonwealth Avenue Street Railway Company. The Standard Company is represented in New England by Edward E. Pet-tee and John J. McCutchan, room 1008, No. 60 State street, Boston.

The R. D. Nuttall Company a few weeks ago sent to its friends and customers copies of R. H. Derrah's "Street Railway Guide" for eastern Massachusetts. This book embodies in convenient form the information that visitors at the convention will wish to know and should prove to be one of the best souvenirs that could be devised.

The Wheeler Reflector Company, with headquarters at 21 Washington street, has its electric headlights on the cars of the Commonwealth Avenue, Quincy & Boston, Lowell, Lawrence & Haverhill, Worcester & Suburban, Newton & Boston, Wellesley & Boston and a large number of other street railways in eastern Massachusetts.

The Christensen Engineering Company, Milwaukee, has its air brake apparatus on a number of Massachusetts roads; among them there are eight straight air equipments on the Brockton Street Railway, and 11 on the Lowell, Lawrence & Haverhill, all with independent motor compressors. On the New York, New Haven & Hartford electric lines are six equipments with No. 2 compressors.

In the power station of the Boston & Newton Street Railway Company, which operates a series of suburban roads connecting with the Boston Elevated system, there are four 200-h. p. Westinghouse compound engines. The Westinghouse Machine Company also furnished the steam loop system for draining the piping and automatically returning the water of condensation and entrainment to the boilers.

The Westinghouse Electric & Manufacturing Company has filled orders for the Boston Elevated Railway Company for 261 No. 3, 25-h. p. street car motors, 165 special 25-h. p. motors, 514 No. 12A, 30-h. p. car motors and switchboard apparatus. For



the Newton & Boston Railway, two 12A, 25-h. p. car motors, and two 200-k. w. belt driven generators. For the Commonwealth Avenue Railway, 82 No. 12A, 30-h. p. car motors and two No. 38B, 50-h. p. motors.

George A. Parmenter will exhibit at the convention several of his patent automatic fenders and wheel guards. A special feature of the Parmenter fender is a mechanism by which it can be moved back under the car some 8 in. when in danger of being damaged. Over 2,000 of these fenders are already in successful operation. The company's general office and works are at Cambridgeport, Mass.

Among the exhibits will be found one of the Duplex Car Company's new cars made by the Briggs Carriage Company, of Amesbury, Mass. This is a summer car and a winter car in one, the windows and flexible sides slide into the roof and can be lowered or raised to suit the weather; thus it will be seen it takes the place of a double equipment. Cars are now being turned out for a number of roads.

The Skeen Electric Switch & Signal Company, of St. Louis, last month equipped the Taunton & Brockton Street Railway with its automatic block signal system. This is an interurban line, single track with turn-outs, and as the cars make quick time a reliable signal system is highly important. Mr. Rogers, the general manager of the road, has expressed himself as much pleased with the working of the Skeen system.

The E. T. Burrowes Company advises us that its curtains have been adopted as standard for the open and closed cars of the West End Street Railway Company. Curtain No. 41 is used on the box cars and No. 482 on the open cars, there being in all 400 cars equipped. All the suburban railways about Boston, including the Lynn & Boston, the Commonwealth Avenue, the Quincy & Boston and Newton roads use car curtains manufactured by the E. T. Burrowes Company.

The Walker Company's exhibit at the Boston convention will comprise: Section of Walker underground conduit system with car in operation; Walker No. 15 L railway motor in operation; Walker No. 15 L motor open to show construction; Walker No. 33 S motor mounted; Walker No. 33 S motor open; set of 33 S armatures in various stages of construction; set of 33 S motor parts; Walker standard trolley; Walker standard railway switchboard panels with wattmeter; "S" controllers in operation; solenoid partitions, open and in operation.

The "Monarc" enclosed arc lamp is being manufactured and introduced to the trade by the Albert & J. M. Anderson Manufacturing Company, of Boston. The lamp is simple and substantial in construction and but 22 in. over all. Although occupying a small space, ample insulation and large radiating surfaces have been provided. The carbons are  $\frac{1}{2}$  in. diameter and 12 in. long, with good contact surfaces in the lamp. The arc is so enclosed that the combustion of carbon is reduced to a minimum and the lamp will burn for 150 hours without retrimming, which is easily and quickly done. Every part of the lamps can be readily removed and replaced. The class B lamps are for multiple series lighting on trolley circuits and have a resistance of  $6\frac{1}{2}$  ohms to each lamp. Clear outer globes and alabaster inner globes are furnished with the lamps. The well-known high standard of the Anderson products is a guarantee as to the excellence of the "Monarc."



The "Monarc" Lamp.

The Bemis Car Box Company, Springfield, Mass., is still doing business, and plenty of it, at the old stand, which has made it a familiar name to all street railway men. In addition to the Bemis patent journal box, the specialties include gongs, car coup-

plers and the Bemis journal oil. Its new double trucks are giving excellent satisfaction, and are running under some of the cars of the Newton & Boston. The officers of this road recently wrote Mr. Bemis that many patrons of the road wait for these cars on account of the easy riding qualities of the Bemis trucks.

The Pearson car replacing jack, made in Boston, is in service on more than 200 electric railways in the country, 27 of which are in Massachusetts, among them being the Boston Elevated, the Commonwealth Avenue, the Lowell & Suburban and the Quincy & Boston. The Pearson Jack Company has received a number of testimonials from street railway managers indicating that the jacks give good satisfaction. The Athol & Orange Street Railway Company writes April 22, 1898: "Your favor of the 21 inst., at hand; we have six of your jacks in use and find them of great value to us in replacing our cars on the tracks, saving us time and trouble." The Leominster & Clinton Street Railway Company writes April 16, 1898: "In reply to yours of the 14, would say that we have your replacing jack on this road, and we would not be without them, as we consider them the best jack there is in the market."

The "Monarch" track cleaner has completed its first year and it is remarkable that only one feature required changing, and that a very unimportant one. The cleaner has great merit, and the most practical superintendents have found it to be all that the manufacturers claim for it. Its adaptability to all styles of cars and platforms is a very strong argument in its favor, but more than this is the fact that it is so constructed that it combines both strength and lightness, so that the most unreasonable abuse has failed to weaken or break it. The motorman has absolute control over the action of the cleaner: The apparatus is made by the Monarch Stove & Manufacturing Company, Mansfield, O., and will be on exhibition at the convention, in charge of Charles N. Wood, who has had a very nice business from its sale in the New England territory. This exhibit will be well worth the attention of managers and car builders who wish to solve the snow problem, where a rotary plow is not a necessity.



The American Rail Joint & Manufacturing Company, Cleveland, has planned a very interesting display of joints, which will include 25 samples of full sized joints and short rails. The rapidity with which these joints can be laid is shown in a letter from Van De Mark & Hill, the constructing engineers of the new Detroit, Lake Shore & Mt. Clemens line, a road connecting the two cities with about 20 miles of track. They report that with only three men on joints, working 10 hours a day, they averaged between 600 and 700 joints daily, and add: "We would further state that our track is laid on a very soft, clay ground, and owing to the difficulty in securing gravel for ballast, we have been compelled to run our heavy construction train over this track without ballast or tamping of any kind for over two months. We consider that this has given your joints about as severe a test as they could be put to, and as yet we have to find the first joint that is broken or has become loose. Our construction train consists of a 20-ton locomotive, and from 8 to 10 standard size flat cars. This train has been run over the track at the rate of from 15 to 50 miles an hour, four to five times a day.

"We consider these joints a success, and that they are doing everything that was claimed for them, if not a little more."

Col. W. E. Ludlow, general manager, will have charge of the Boston exhibit of his company.

The Cumberland Valley Railroad Company, which is controlled by the Pennsylvania Railroad, obtained a controlling interest in the Harrisburg & Mechanicsburg Electric Railway, and it is announced that the line to New Cumberland from Harrisburg will be completed at once.

## LOOK OUT FOR THE FAKE ACCIDENT FRAUDS.

Exposure of Three Daring and Clever Schemes—Two Have Broken Ribs and Work the "Loose Screw" Game—The Other Sprains His Ankle to Order—How It Is Done.

Through the courtesy of O. B. Stuart, of the Chicago office of the Union Casualty & Surety Company of St. Louis, we are enabled to present some data as to the methods of three swindlers who have been successfully imposing upon various transportation companies as well as insurance companies.

Two of these men work what might be called the "loose screw" game, and so far as we know have only attempted it on steam roads, though one might think that the street cars would offer an equally good field. The method is for the two men to enter a train at a terminal station as soon as the gates are opened, and loosen one of the screws fastening the iron plate sunk in the floor at the point where cock for cutting of the steam supply is located. The screw is loosened until it projects half an inch or so. When the conductor comes to take up the tickets the men tell him that one of them stumbled over the screw and falling against a seat hurt his side, and also sprained his ankle, but express the belief that the matter will not prove serious. A few days later word is sent to the company and a visit from its surgeon is requested. The surgeon arrives and finds a badly swollen ankle and a fractured rib; and on his report a settlement is generally made by the company.

These two men have usually given the names of R. H. Davenport and Gilbert J. Moffett, and claimed to be artistic salt decorators (they decorate windows with magnesium sulphate and beer); sometimes one is injured and sometimes the other; the one who is not injured always serves as witness.

Davenport has a claim against the Union Casualty & Surety Company. Mr. Stuart had learned from another insurance company that about a month previous the same man had met with another accident, on a railroad train between South Chicago and Chicago. He investigated the matter and found that the Illinois Central Railroad had paid R. H. Davenport \$100 for injuries received in stumbling over a screw in one of its cars on May 23, 1898, and that the Chicago, Rock Island & Pacific had paid the same man \$200 for injuries received in stumbling over a screw November 29, 1897. Also the Chicago, Milwaukee & St. Paul had paid Gilbert J. Moffett \$150 for injuries received by stumbling over a screw in a car at Racine, Wis., in April, 1898; Davenport was the claimant's witness.

It has been discovered that each of these men has an un-united fracture of one rib, so that the examining surgeon always finds a broken rib. The swollen ankle is probably produced to order by bandaging the leg or by injecting croton oil into the joint; this latter method is the one followed by one Pascoe who served a term in the New York penitentiary, having been convicted of defrauding transportation companies.

The third man referred to is known as Edward Lanse, C. F. Powers, Robert P. Smith, Charles Rice, C. F. Rice, Frank Kramer, Thomas Wright, Harry Bidwell, being at present in jail at Saginaw, Mich., under the name of Rice. His method is to secure accident policies and then sprain his ankle on alighting from a street car, or by stumbling in the gangway of a steam boat. When injured he makes a claim against the insurance company and also against the transportation company; if the company asks too many questions the claim is usually dropped and he gets another sprain somewhere else.

Rice rents no less than five postoffice boxes in Saginaw, two under the name of Powers, the others as Rice, Smith and Stanley; in addition to these it is known that he has at least six others, one each at Lansing, Mich.; Bridgeport, Mich.; Colima, Mexico; Centerville, Ia., and Paine's Station, Mich. He is thus enabled to give various addresses, the mail being forwarded from one office to another.

Rice meets with his accident and at once goes home and wraps a rubber bandage some 3 in. wide and 3 ft. long around his leg above the ankle, leaving it in place for 24 hours or as long as he can stand the pain and then sends for the company's surgeon. When the surgeon arrives he finds a foot so badly swollen that really no thorough examination can be made, but it looks bad, and the case is passed.

Rice's witnesses are his wife, whom he claims is his sister, and her brother. Her maiden name was Scherping and her first husband was named Stanley; both she and her brother are used as witnesses twice, once as Scherping and again as Stanley.

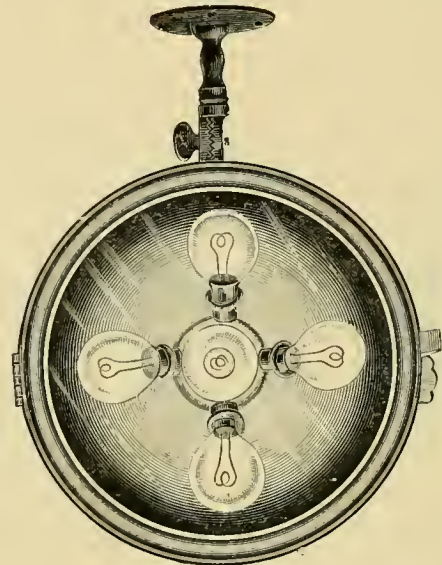
In January, 1898, Rice secured \$75 from an insurance company, on March 25, 1898, he got \$150 from another, and July 19, 1898, \$100 from a third, all for sprains. His wife states that she believes he has successfully defrauded about 40 insurance, street railway and steamboat companies. Among the street railway accidents mentioned in a memorandum found among his papers and evidently made to refresh his memory as they give the date, town, name and age claimed on each occasion, are the following:

Apr., 1897, C. Rice, Saginaw, Mich. ....	36 yrs.
May, 1897, Frank Kramer, Ottumwa, Ia. ....	34 yrs.
July, 1897, Thomas Wright, Rock Island, Ill. ....	39 yrs.
Nov., 1897, (name illegible), Cincinnati, O. ....	30 yrs.
Mar., 1898, C. Rice, Lansing, Mich. ....	38 yrs.

Mr. Stuart did some very pretty detective work in connection with the Rice case. He went to Saginaw to investigate the claim made against his company by "Edward Lanse," when his man was known in Saginaw only as Rice. Arriving at noon, he had by 3 o'clock located Rice's house, interviewed his wife, searched the premises, found his private papers buried under the barn, and located the man in the county jail where Rice is now held for assaulting his wife. Rice has confessed the last fraud.

## SMITH'S NEW FIVE-LAMP HEADLIGHT.

Smith of New York, he who has a world-wide reputation for all kinds of railway illumination, not only keeps on making the large variety of excellent lamps enumerated in his big catalog, but constantly brings out new things. His latest is a 5-lamp headlight, in which the cluster is mounted on a swinging standard



for adjustment as desired. The cut readily explains the plan. These headlights are meeting with satisfaction, particularly on interurban and suburban lines, where high speed and the absence of street lights require a strong light. They are also found admirably adapted to construction work, being so easily carried and connected up and throwing a powerful light.



## ECHOES FROM THE TRADE

Alonzo G. Collins, M. E., Pabst building, Milwaukee, is making plans for remodeling the steam plant of the B. J. Johnson Soap Company, Milwaukee, which will include a 100-h. p. boiler and an addition to the boiler house.

The American Improved Rail Joint Company, Monadnock building, Chicago, has the contract for cast-welding the 18th street and the Leavitt street lines of the West Chicago Street Railroad; the company is also working on the Kansas City, Mo., lines, having two outfits there.

The Corning Brake Shoe Company has been doing an excellent business of late, orders for no less than 9,000 brake shoes being booked during July from New York city alone. The Joshua Hendy Machine Works, of San Francisco, will be the representatives of the company on the Pacific coast.

The American Rail Joint Company, Cleveland, has appointed Julian L. Yale & Co., Rookery building, Chicago, agents for the west and northwest. The Chicago office has recently closed a large order with the West Chicago Street Railroad, which is the fourth order received from that road.

The Joseph Dixon Crucible Company has issued a new edition of "Graphite as a Lubricant," revised and enlarged. It contains many valuable suggestions to engineers on the subject of lubrication of nearly every form of machinery. A summary of tests is given which shows the efficacy of graphite for lubrication.

The Westinghouse Electric & Manufacturing Company and the Baldwin Locomotive Works are co-operating in the manufacture of electric mine locomotives. The locomotives are made in sizes from 20 to 150 h. p. and are equipped with Westinghouse motors, rheostat controllers, fuses, lightning arresters, electric headlights, etc.

George A. Cragin, general southern agent of Washburn & Moeb, has been sending out from Galveston, to his many friends, one of the neatest and most unique desk souvenirs we have seen in a long time. It is one of the few which are sure to find a permanent place upon the desk, and every time we look at "her" we remember him.

The J. G. Brill Company has delivered to the Chattanooga (Tenn.) Rapid Transit Company three new cars for suburban service. These cars are of large size and handsomely finished. The trucks are built so that electric motors can be mounted, but it is now proposed to use the Patton motor cars on these lines and have the new cars for trailers.

George D. Munsing, manager of the Tampa, Fla., road is now building some of his combination cars, described in the July REVIEW, page 459, for double equipments. They are to be 34 ft. long, seating over 50 passengers; they will be mounted on du Pont trucks, equipped with electric brakes. They are designed for a speed of 25 miles per hour on suburban lines.

Merchant & Co., Incorporated, Philadelphia, are makers of high grade roofing plates, bright plates, solders, babbitt and mixed metal, "Gothic" shingles, "Spanish" tiles, etc., and have recently issued their 1898 illustrated catalog and price list which will be found very interesting by those in the market for metal roofing, lathing, etc., or the machines for working the same.

Elmer P. Morris, 15 Cortlandt street, New York, as announced some time since, has added a foreign department and offers his

services to foreign buyers of American electrical apparatus in purchasing, inspecting, shipping, etc. A small commission is charged for this service, and foreign customers will get the benefit of the lowest net prices and all rebates which the makers offer.

The Baltimore Car Wheel Company is to furnish the trucks and wheels for 150 cars recently ordered by the Baltimore Consolidated Railway Company. This is the third order received by the company from this road since its organization in June, 1897, when the Baltimore Traction Company and the City & Suburban Railway Company were consolidated; the three orders aggregate 230 trucks.

We have had several requests for information as to the whereabouts of R. Graham-Woodward, who came from San Francisco and opened an office at 26 Cortlandt street, New York. There are quite a few people, including the landlord, who would like to renew his acquaintance. He attended the last convention with a bicycle holder for street cars, and appeared to be a gentleman. He turns out to be a beat.

The performance of the U. S. S. Oregon in making a voyage 14,500 nautical miles (16,700 statute miles) in 80 days, and then reporting at once for active service has excited the admiration of all engineers, and shows the excellence of her machinery. The crank shafts, line shaft, thrust shaft and propeller shaft are all hollow forgings, with a 6-in. hole through them; they were made by the Bethlehem Iron Company, South Bethlehem, Pa.

The brilliant successes of American arms in Cuba will be followed by commercial achievements equally as gratifying so soon as peace shall be arranged. Even now there are straws visible indicating the wind of commerce; one of these is an order for a 100-h. p. plant, comprising Westinghouse engine and generator, boiler, pump, piping, etc., received by the Westinghouse Machine Company. The plant is to be installed at Santiago de Cuba.

We are in receipt of a letter from the J. G. Brill Company, advising us that it is about to bring suit against the Peckham Company, as it has in the past against others, for infringement of the patents on the Brill maximum-traction truck, which was first introduced by the Brill Company in 1888. With the rapid increase in large cars there has grown up during the past two years a large demand for the Brill "Eureka" maximum-traction trucks, which are giving great satisfaction and already are standard on a large number of roads.

The Walker Company has the contracts to furnish forty 500-h. p. alternators to the Union Carbide Company, of Chicago. An order for 20 of these machines was first received, which is stated to be the largest single order for alternating machinery ever placed; and a few days later Mr. Short, vice-president of the Walker Company, visited Chicago and closed the contract for a duplicate order.

The General Omnibus Company of Paris has decided upon the erection of two power houses; one for compressed air at Billancourt, and one for electricity at Vincennes. The latter will furnish current at 500 volts for charging the accumulators used on some of the company's cars. Babcock & Wilcox boilers will be installed in both plants. The Omnibus Company now has tram cars operated by the Rowan and the Serpollet steam motors and by compressed air, and will install overhead, underground and surface contact electric systems.

There is by far more creosoted wood conduit used in carrying the street railway feeders and cable in Philadelphia than any other form of conduit, and this has been furnished by the Michigan Pipe Company. This form of conduit has been extensively used for electric lighting, telephone and telegraph wires service and for all the wires owned by that city. The company reports that it has sold large quantities of creosoted wood conduit to the New England Telephone & Telegraph Company for the underground cables in Boston and other cities in New England.

The Hingham (Mass.) Street Railway Company wrote to Harold P. Brown that the plastic rail bonds, which have been in use for the past two years and a half, are as good as new, and that tests have shown that the bonds give practically an electrically continuous rail. The manager of the Bennington & Hoosic Falls reports that one mechanic with three laborers put plastic bonds on from 60 to 70 rail joints a day. This bond has been adopted for the new lines of the Union Railroad in Providence, the inter-urban roads around New Bedford, Framingham and elsewhere. The following table shows the results of tests of rail bonds made February 15 to 17, 1898, at the power station of the Boston Elevated Railway Company by the electrical engineer, Roger W. Conant:

90-lb. rail joint with plastic rail bonds under both angle plates. 12 in. between centers.			90-lb. rail joint with two West End No. 0000 copper bonds. Raile and plates new and rail ends touching. 12 in. between centers.		
Amperes.	Volts.	Temp. of Bond.	Volts.	Temp. of Bond.	Volts with angle plates removed and rails separated.
500	-----	-----	-----	-----	.025
600	-----	-----	-----	-----	.03
650	-----	-----	-----	-----	.033
750	-----	-----	.0138	-----	-----
800	-----	-----	.0138	-----	-----
850	.0058	-----	-----	-----	.045
900	.0063	-----	.0160	-----	.0495
1,000	-----	-----	.0169	-----	.053
1,100	-----	-----	-----	-----	.064
1,200	-----	-----	-----	-----	.07
1,400	-----	-----	.0269	-----	.081
1,500	.0118	19 C	.0284	26 C	.086
1,600	.0128	-----	.03	-----	.095
1,700	-----	-----	.0325	27 C	-----
2,300	.0175	19.5 C	.043	-----	-----
2,300	.0185	-----	.045	-----	-----
2,400	.019	-----	.047	34 C	-----

The Electric Storage Battery Company, of Philadelphia, through its western manager, Frank H. Clark, in July closed a contract with the South Side Elevated Railroad Company, of Chicago, for two storage batteries, each of 700 h. p. capacity, one to be installed in the power house at 12th street, and the other at 61st street. Each battery will be installed with tanks and bus bars sufficiently large to permit of an increase to double the present capacity. The batteries will be placed in parallel with the line, and will be used to take care of the fluctuations and maintain practically a constant potential at extreme points on the line. This will be the largest storage battery installation that has been made for feeder regulation. The batteries are expected to be in operation by September 15.

The No. 2 universal wood worker, made by the Egan Company, 322 to 342 West Front street, Cincinnati, is what may be called a car shop necessity. It is simple and easy of adjustment, and will do almost any kind of work; it will make glue joints; plane "out of wind;" chamfer; cross-gain; groove; cut straight; circular or elliptical moldings; tongue and groove; corner; plane taper; raise panels; miter; rabbet; will rebate and joint window blinds at one operation; make serpentine and wave molding; table joints; fluting and beading on corners or face of balusters; plowing; rip and cross-cut sawing; boring; routing, etc., etc., in fact the variety of work is limited only by the ingenuity of the operator. This machine will also plane out of wind up to 1 1/2 inches wide, and square one edge up to 4-inches thick at one operation.

The Eagle Iron Foundry, of Corry, Pa., is prepared to fully answer a troublesome question often asked by the operating officials of railways, i. e., "Where can we get a brake shoe that

will give satisfaction in all respects?" This foundry has spent years, and a great deal of money, in perfecting special mixtures of metals; it is the owner of Martin Ressler's patented iron mixtures. Among its specialties are brake shoes which give the best possible results in wear of shoes and saving of tires. These shoes are comparatively soft, but have a minimum mileage record of 12,000 miles, and no cases of broken shoes have ever been reported. The mixture is one of Mr. Ressler's. The Eagle Foundry brake shoes are recommended by the Oil City Street Railway, the Erie Electric Motor Company, the Jamestown Street Railway, the Jamestown & Lake Erie Railroad, the Western New York & Pennsylvania Railway, and the Buffalo Railway.

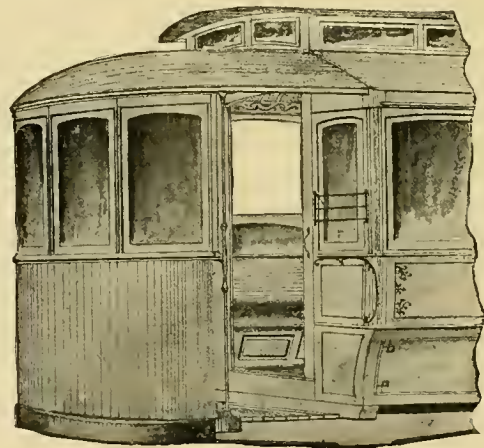
## VESTIBULES.

J. P. Sjoberg & Co., of New York, manufacturers of wood work for repairing and rebuilding cars or for new cars complete, are making vestibules which can be added to cars not so fitted.



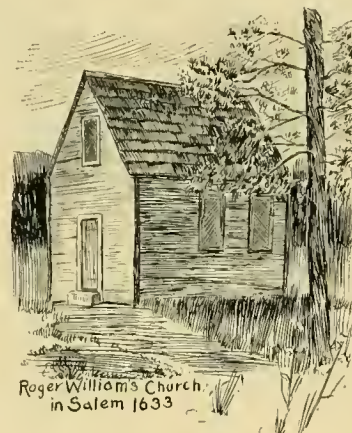
The vestibule projects a few inches over the dash to avoid moving the controller box, although the brake rod has to be moved back about 10 in. to allow clearance for the handle. The general appearance of the vestibule is shown in the cut. The Consolidated Traction Company, of Jersey City, and the North Hudson County Railway Company, of Hoboken, N. J., equipped a large number of their cars with these vestibules last fall.

The illustration shows the patent sash and blind spring, made by this company; it is of high carbon steel, tempered and plated



SJOBBERG VESTIBULE.

in light bronze or nickel to suit the trimming on the cars. These springs are flexible and will always keep their shape and elasticity; they work easily and will not catch in the guiding strips. Large orders have been received for these springs.



Roger Williams' Church in Salem 1633



**THE PECKHAM NO. 15 TRUCK.**

The accompanying illustrations show the Peckham No. 15 swivel truck and one of the interurban cars mounted on them. This truck is designed for heavy and high speed interurban and elevated railway service and is built heavier throughout than the standard No. 14 and No. 14 A types. The two sets of bars forming the middle of the side frame, are placed farther apart to permit the swinging of a nest of half elliptic springs between them. The bolster is built up in truss form of two flat bars of a thickness and width suitable for the car bodies to be carried, and these bars are carried by adjustable posts. Secured to the top bar of

menting in this direction the action of the yoke springs located directly over the journal boxes. The motors are supported upon the transoms which are rigidly secured to the side frames of the truck which in turn are provided with corner brackets or braces to keep the truck in alignment. The brakes used on this truck are the double lever style and are very powerful; the journal boxes are the M. C. B. standard.

These trucks are used on a number of interurban roads among which may be mentioned the Milwaukee, Racine & Kenosha and the Cleveland, Berea, Elyria & Oberlin. The car shown is one on the latter road; the body was built by G. C. Kuhlman & Co.; it is equipped with the Christensen air-brake.



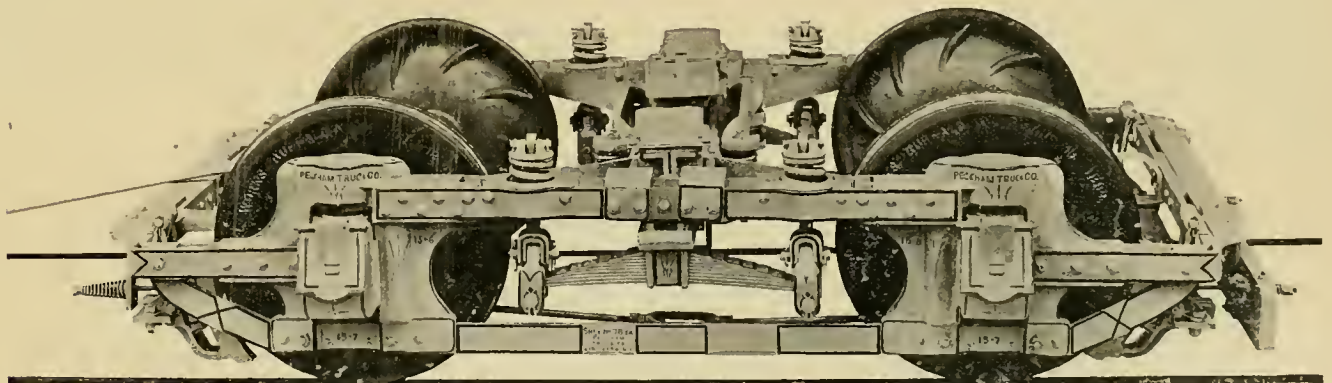
INTERURBAN CAR MOUNTED ON PECKHAM NO. 15 SWIVEL TRUCKS.

the bolster are "King" side bearing springs to provide for a slight rocking motion of the car body. The bolster is supported at each end on one or more half elliptic springs, depending on the weight of the car body to be carried and the ends of these springs are carried in universal M. C. B. links, which permit of motions both longitudinal and transverse, thus permitting the span of the springs to increase as the load comes on them, and at the same time acting as links providing for the transverse swinging of the truck bolster. These links are supported upon the side frames by coil springs making three separate sets of supporting springs, the bolster half-elliptic, the bolster link coils, and the journal box coil springs, between the car body and rail.

The top bolster is guided between the upper bars to prevent

The substitution of electricity for steam on the railroads of Switzerland is receiving consideration and an important experiment in this line is now being carried out. Water power is abundant, affording a cheap supply of electricity while only coal of poor quality can be obtained and that at a high price. A water power is being developed near Thun and the current will be transmitted to the railroad over which electric cars will be operated.

F. H. Treat was in July re-elected president of the Wilmington & New Castle (Del.) Railway Company. The treasurer's report for 11 months showed receipts of \$40,000 and expenses of \$26,000, a very gratifying statement for a 6-mile road.



PECKHAM NO. 15 SWIVEL TRUCK.

motion in a direction longitudinal with the car body. These guides serve to transfer the draft of the motors from the trucks to the car body. The location of the half-elliptic springs between the bars of the side frames permits the drawing down of the bolster to the narrowest permissible width, thus shortening the wheel base of the truck. This location of the elliptic springs also imparts to them the properties of an equalizer, permitting any of the wheels to rise independently of the car body and supple-

G. J. Smith, master mechanic of the South Covington & Cincinnati Street Railway, Covington, Ky., was a caller on the Review when in Chicago recently.

Col. W. E. Ludlow, president of the American Rail Joint & Manufacturing Company, Cleveland, was a caller at our office last week. He reports the outlook for new business excellent.

## NEW YORK STATE ASSOCIATION.

The 16th annual meeting of the Street Railway Association of the State of New York will be held at the Hotel St. George in Brooklyn, on September 13 and 14, 1898. It is the custom of this association to submit a list of topics for discussion to the various companies with a request that representatives choose a topic and prepare a paper on it.

The list of subjects is printed below, but at the time of going to press we have not a complete list of the assignments.

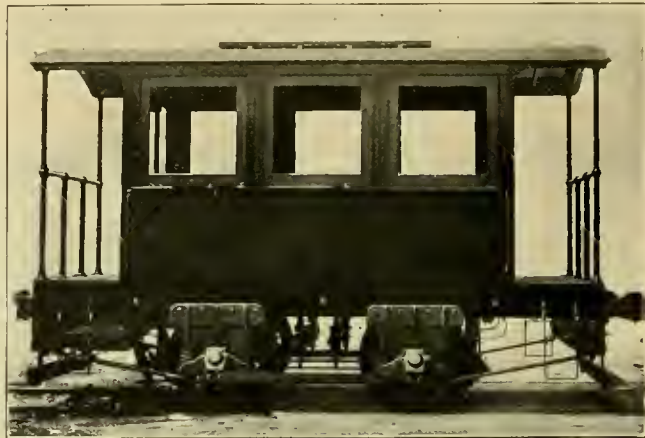
Storage Battery  
 The Repair Shop  
 "The Third Rail."  
 Municipal Ownership  
 The Care of Dynamos.  
 "The Metallic Circuit."  
 General Track Construction  
 The Standardization of Trucks.  
 The Use and Abuse of Transfers  
 Points on Financial Organization  
 Pointers on Store Room Accounts.  
 Ties; Their Life and Preservation.  
 Daily Inspection of Car Equipment.  
 Long Distance Power Transmission  
 Suggestions for Car Mileage Records.  
 Signal System for Single Track Road  
 Pleasure Resorts; Are They Profitable?  
 "By Products at Power Station." T. J. Nicholl, Rochester  
 The Organization of Street Railroad Employes.  
 Fenders; Their Advantages and Disadvantages  
 How Can We Increase the Efficiency of Employes.  
 The Use of Air and Power Brakes for Electric Cars  
 Track Bonding—How Can We Obtain the Best Results?  
 Freight and Express Service on Interurban Electric Lines.  
 Possibilities and Advantages of Interurban Electric Roads.  
 Low Joints—How to Remedy Them; How to Prevent Them.  
 Accident Insurance; the Best Form; Can We Insure Ourselves?  
 Municipalities vs. Street Railroads; Their Relation to Each Other.  
 The Use of Individual Fare Boxes; Are They Practicable? M. M. Fenner, Fredonia.  
 Removal of Snow and Ice; From a Practical and Economic Standpoint.  
 The Prevention of Accidents; the Best Means of Accomplishing This End  
 Rails—Their Construction from a Scientific Standpoint. Results of Chemical Analysis. A. J. Moxham, Johnstown, Pa  
 "Receipts From Other Sources." How to Obtain Best Results From Sale of Advertising Privileges, Power, Etc.

The Baltimore street railway companies report their park tax, 9 per cent of the gross earnings, for the quarter ending June 30, 1898, as follows: City Passenger Railway, \$25,951.09; Consolidated, \$36,951.09; Central Railway, \$4,695.

The Baltimore City Passenger Railway Company is to issue \$2,000,000 more stock. The proceeds will be used to pay for the Central Railway Company's lines, electrifying the Red and White lines, installing new power house machinery, and to constitute a reserve for future improvements.

## ELECTRIC SWITCHING LOCOMOTIVE.

The McGuire Manufacturing Company is building two electric switching locomotives for the General Electric Company, one to be used by the New York Sugar Refining Company, New York City, and the other to be used by the Hoboken Railroad, Warehouse & Steamship Connecting Company, Hoboken, N. J. They

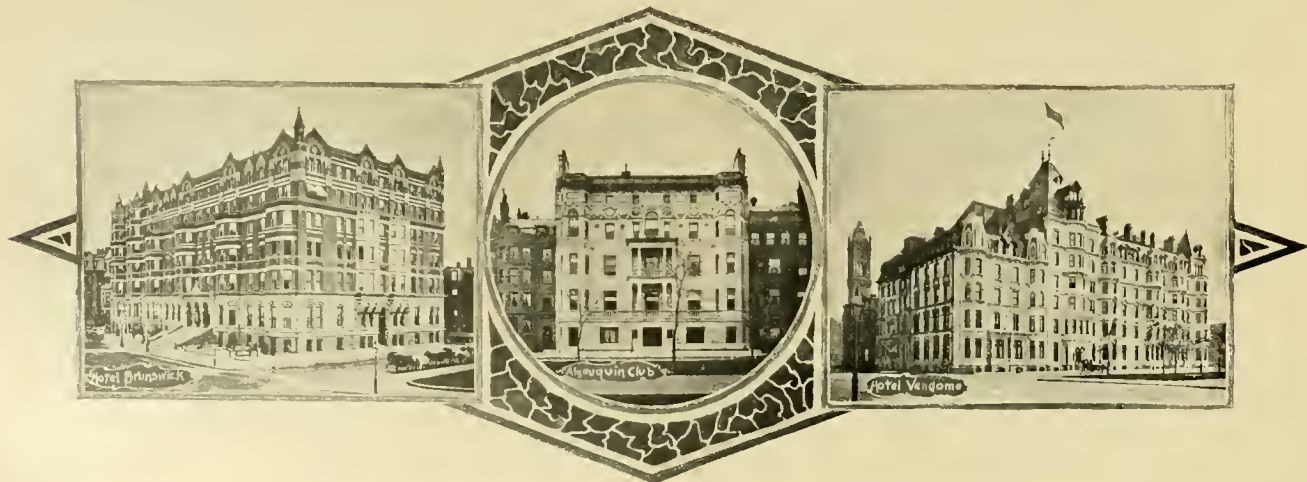


MCGUIRE ELECTRIC LOCOMOTIVE.

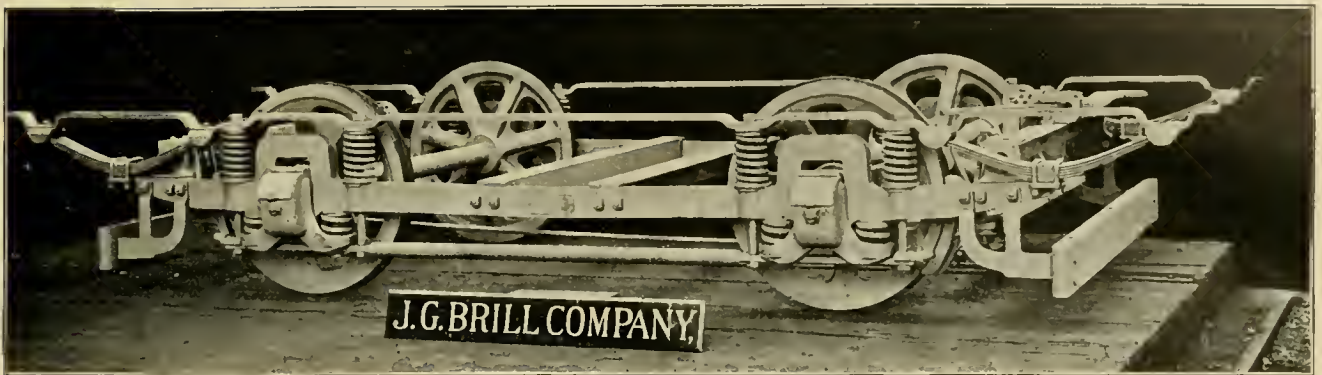
are to be equipped with G. E. 51 motors inside the wheel base, equal to 200 h. p.; the wheel base is 5 ft. 6 in. and the wheels are 36 in. in diameter. The total weight is 28,000 lbs. Each locomotive is to be equipped with Westinghouse air brakes, locomotive bell and a 5-in. air whistle.

## A CATALOG ON MICA.

A neat and interesting catalog has been published by the Mica Insulator Company. For an introduction is a short pictorial history of mica, showing how this important insulator is mined, sorted and trimmed by the Hindoos of India. A description is then given of the manner of splitting and re-assembling the raw laminations of the mica crystals resulting in a homogeneous material, micaite. Useful tables are also given including resistances, break-down voltages, etc., of a number of insulators. Some instructive articles are printed on "Physical Properties of an Insulator" and "Field Spools." Micaite plate, cloth, paper, commutators, segments, rings, and other specialties of the company are described. One striking feature showing the extent of the street railway business of the country is a list of commutator insulators for 51 types of railway motors.







**A STANDARD BOSTON CAR.**

The accompanying illustration shows one of the 9-bench open electric motor cars of the Boston Elevated Railway Company. This is one of 75 such cars recently built by the J. G. Brill Company, following the Boston standard drawings and specifications. It has the Brill patent malleable iron seat end benches and is mounted on the Brill No. 21 B truck, better shown in the other engraving. Within the last 18 months this road has purchased upwards of 400 of these trucks.

In connection with Boston and the Brill Company it is interesting to recall that John A. Brill sold to the General Electric Company a truck which was one of the first independent motor trucks ever built. It was put in operation on the Boston & Revere Railroad and was in successful operation for many years; it is believed to be in operation today.

The gross earnings of the Brooklyn Heights Railroad Company for July were \$572,116, an increase of \$82,653 over the corresponding month last year.

W. H. Holmes, vice-president and general manager of the Metropolitan Street Railway Company, Kansas City, Mo., has offered to give \$500 and raise \$500 more among his friends for an ice fund to furnish ice to the poor.

A new company, the Quebec, Montmorency & Charlevoix Railway Company, has taken over the entire system of the Quebec District Railway Company. Bonds amounting to \$1,500,000 have been sold to Hanson Bros., of Quebec; some \$350,000 will be expended in improvements and extensions.

**RAILWAYS OF SAGINAW TO BE SOLD.**

In the case of the Boston Safe Deposit & Trust Company against the Union and Consolidated street railway companies of Saginaw, Mich., an order was filed August 13 authorizing the sale of the property of the Consolidated Street Railway Company. The court also authorized the sale of the Union Street Railway after November 26. The bondholders of the two companies are trying to come to some agreement in order to consolidate the two systems.

**TEAPOT COLLECTORS DISCONTINUED.**

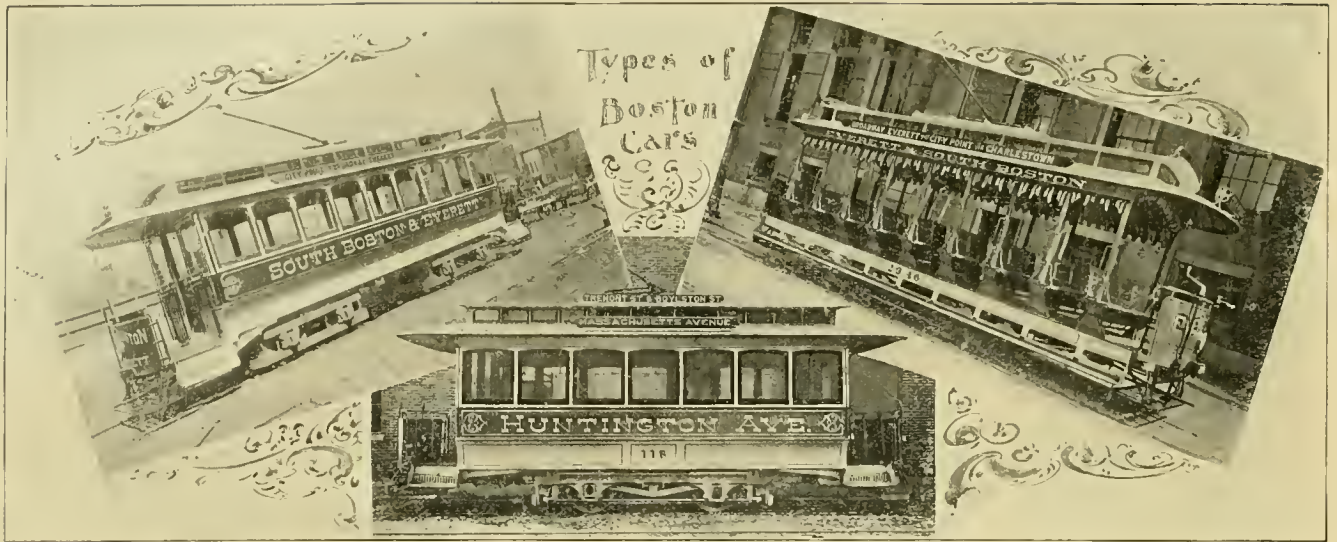
After the decision of the supreme court of Michigan (REVIEW, July, p. 470), the announcement of the receiver of the Union Street Railway Company, of Saginaw, that the teapot fare boxes would be dispensed with during the summer season of heavy traffic, is in the nature of a surprise. The reason given is that the conductors would be exposed to danger in so collecting fares on the foot boards of crowded cars.

The Delaware (O.) Electric Street Railway on August 4 gave the first of a series of evening pleasure excursions over the several lines of the road; it proved popular and there will be two excursions each week so long as the traffic justifies them.

On July 4, the Cleveland roads carried 282,896 passengers; of these the Big Consolidated had about 150,000; the Little Consolidated, 111,000; the A., B. & C., 9,000; the Cleveland & Painesville, 6,000; the Lorain & Cleveland, 4,900; the Chagrin Falls, 2,350; the Cleveland, Elyria & Oberlin, 5,000.







### A SPLENDID RUN.

John I. Beggs, general manager of the Milwaukee railway and light systems, is making some notable improvements in his lines, nearly a million dollars having been recently expended. Recently he opened the new line to Waukesha, 26 miles long, connecting that city with Milwaukee. A few days later, and long before the track construction men were through, he made a run, starting from Kenosha and reaching Waukesha by way of Milwaukee, covering the distance of 61 miles in two hours and 25 minutes. In view of stops for railroad crossings, slower speed through several cities and towns, and a considerable portion of unsurfaced track, Mr. Beggs has good reason to consider his run a record breaker.

Receiver R. B. Baer, of the Galveston City Railway Company, reports a balance of \$7,388 from the June operations. This gives a total surplus of \$39,579 on hand.

The Patterson (N. J.) Railway Company paid \$10,726.28 in settlement of a judgment given three years ago on account of a trolley car cutting off the leg of a five year old boy.

The postmaster at Kansas City has been conferring with the officers of the Metropolitan Street Railway Company in reference to mail cars which are much needed as the facilities for handling mail are inadequate at present.

L. R. Cummings, a conductor on the Cicero & Proviso electric line, Chicago, was killed while collecting fares on a crowded car July 17; he swung out on the rear step and was struck on the head by a trolley pole in the middle of the street.

July 21, the street car service of Sacramento, Cal., was interrupted by reason of low water in the American river at Folsom, 20 miles away, where the power is generated. Arrangements were made to use the steam power so long as the low water continues.

C. Townsend Blake, Philadelphia, who makes a specialty of handling railroad bonds, has recently sold an issue of \$100,000 of first mortgage 6 per cent bonds of the Mason City & Clear Lake Traction Company of Mason City, Ia. These bonds were sold in Boston.



Union Station



Providence Station & Park Square



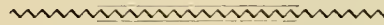
CHARLES J. MAYER.

A. H. ENGLUND.

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AMERICAN ELECTRIC HEATING CORPORATION,	- - - - -	BOSTON, MASS.
Electric Car Heaters of Every Design.		
BRADFORD BELTING CO.,	- - - - -	CINCINNATI, O.
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STERLING VARNISH CO.,	- - - - -	PITTSBURG, PA.
"Extra" Insulating Varnish.		
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AMERICAN RAIL-JOINT & MFG. CO.,	- - - - -	CLEVELAND, O.
"Boltless" American Rail Joint.		



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**A MONSTER GENERATOR FOR BOSTON.**

The commutator illustrated is for the largest generator ever designed, which will soon furnish current for the lines of the



WALKER MAMMOTH COMMUTATOR.

Boston Elevated Railway Company. This machine, which is now in the process of construction at the works of the Walker Com-

pany in Cleveland, has a rated capacity of 2,700 k. w., or approximately 4,000 h. p., but will be capable of carrying an overload up to 5,000 h. p.

There are alternating current generators which are rated as high as 5,000 h. p., but it should be remembered that these are high speed machines and operated by water turbines, while the Boston dynamo will run at 75 r. p. m., thus necessitating a greater size and weight than any other generator ever constructed.

The total weight of the Boston generator will be about 300,000 lbs.; the armature alone weighing 115,000 lbs. and is 15 ft. 6 in. in diameter. The shaft on which this mass of copper and iron is to revolve is 3 ft. in diameter. There will be 24 poles. The outside diameter of the commutator is 8 ft. 9 in.; the outside dimensions of the whole machine on the foundation will be 25 ft. At normal load the generator will give an output of 4,500 amperes at 600 volts, this being sufficient to operate 300 loaded street cars.

The field magnet is 21 ft. 8 in. in diameter. In this field magnet lies the chief difference between this generator and the smaller ones of this type. Instead of being of cast iron the field frame is of steel, cast hollow and provided with hand-holes, one for each pole. The poles are of laminated wrought iron as in all Walker railway generators but they are bolted into this frame instead of being cast into it. The hand holes referred to give easy access to the bolts holding the poles in place.

The Walker Company has many railway generators of 1,600 k. w. capacity in successful operation; among them being those in the Kent avenue power station, Brooklyn; in the power stations of the Union Railway Company, New York; and the Metropolitan Railway Company, Kansas City; but Boston will have the distinction of having the Titan of them all.

The Hazard Manufacturing Company, Wilkes-Barre, Pa., has commenced running its new machinery for making 6-ft and hard drawn copper wire, and will shortly be producers of insulated copper wire of all kinds.

**Everything goes down before it!**

*A Supreme Success!*

**Better than Leather... and half as costly.**

Made in All Standard Colors. Plain, Morocco, Grains or Embossed.

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*Does not Crack, Rot or Peel, and is not affected by Heat or Cold. Water Proof, Grease Proof, Stain Proof, Odorless; Contains no Cellulose or Rubber and is not Inflammable. CAUTION! There are dangerous and worthless imitations.*

**The Pantasote Co., 29 Broadway, N. Y. City**





**TROUBLE IN MARKET STREET, SAN FRANCISCO.**

Market street, the main business artery of San Francisco, has been occupied by four parallel street railway tracks, the two in the center of the street being cable tracks and the others horse tracks. Since the Market Street Railway Company succeeded to the companies that formerly occupied this street it has made but little use of the two horse car lines, cars only being run to satisfy the conditions of the ordinance so as to hold the franchise and keep out competitors from this street.

July 25, 1898, the Board of Supervisors of the City and County of San Francisco passed a resolution reciting that the Market



MARKET STREET, SAN FRANCISCO.

Street Railway Company was maintaining two of its four tracks without legal authority, and ordering their removal, the superintendent of streets being directed to take them up if the company did not do so by August 6. The company, under date of July 29, protested against this action and notified the Board, the members thereof, the mayor and the superintendent of streets, that it would hold them jointly and severally liable for any damages that it may sustain by reason of the removal of the tracks. The company states that it operates the tracks in question strictly according to the terms of its franchise.

The inference is that this protest is to fix the liability upon the city and its officers, if the company should be damaged by reason of a competing line making use of the portion of the street now vacated.

Another point of difference between the city and the company is in regard to the paving of the space occupied by the tracks. The company by direction of the city put down basalt block pavement when the street was improved, and this being in good repair, it declines to tear it up and substitute bitumen on a concrete base.

A large power plant is being erected near the coal deposits of Cañon City, Colo., current being transmitted to Cripple Creek for railway and mining purposes.

The stockholders of the Toledo, Bowling Green & Fremont Railway Company at the regular meeting accepted the resignation of F. J. Hoag, as president, and elected Edwin Jacoby to fill the vacancy. The matter of extension was also considered, as the franchise provides that the line shall be extended five miles by December 30.

In December, 1894, after competitive trial lasting 15 months, E. F. DeWitt & Co., of Lansingburgh, N. Y., equipped 175 cars for the West End road with "common sense" sand boxes, which are reported as in good condition at the present time. This firm has also had 14 equipments in service on the Gloucester Essex & Beverly Street Railway for three years.

**The Q. & C. Co.**  
**Compound Lever Jacks**

**Solid Main Frame.**  
**Patent Adjustable Levers.**  
**Quick Trip Action.**

**THEY ARE STRONG SAFE PURE**



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**Self-Feeding Rail Drill**

Will Bore 7-8 in. Hole in Less than One Minute.

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EASY ACTION.



VERTICAL and LATERAL ADJUSTMENT.

DURABLE CONSTRUCTION.



LIGHT WEIGHT.



USED INSIDE or OUTSIDE of RAILS.



Furnished with Over or Under Rail Clamps, as desired. Top removed for Passing Cars in Two Seconds. Quickly readjusted for work. Get Our Catalogue and Prices before Placing Your Orders.

**The Q. & C. Company,**

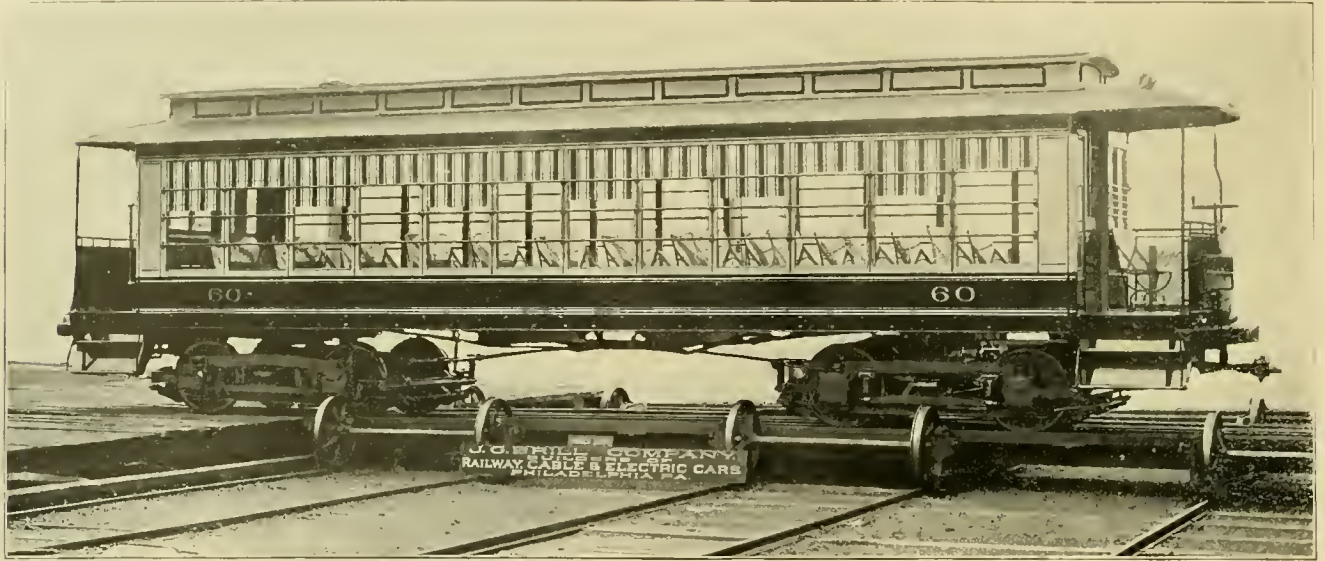
700-709 WESTERN UNION BLDG. CHICAGO, ILL.

## NEW CARS OF INTERESTING TYPES.

The Cleveland, Painesville & Eastern Railroad is just putting in service some interesting open cars of large size and rather unusual construction. They are intended for high speed (45 to 50 miles per hour), and are constructed in an unusually substantial

weight. In all parts of the car care has been taken to reduce the weight as far as possible without sacrificing strength. The car side up to the level of the window openings is of the usual steam car style somewhat modified because there is much less than the usual depth.

The dimensions are as follows: Length of the body, 42 ft.;



CLEVELAND, PAINESVILLE & EASTERN CAR.

manner. One of these cars is shown in the accompanying engraving. In appearance there is a curious blending of steam and street car features. The roof and hoods for example are of the street car type. The platforms combine the features of steam car steps with the street car dasher and headlight. But the steps are fitted upon one side only of the car and the platforms are intended to be occupied by passengers. For this reason the door is placed at one side of the center next the steps and on the other side of the platform a seat is placed. The platform of course has but a single opening. The construction is unusual and very strong. It was designed by the J. G. Brill Company of Philadelphia who built the cars.

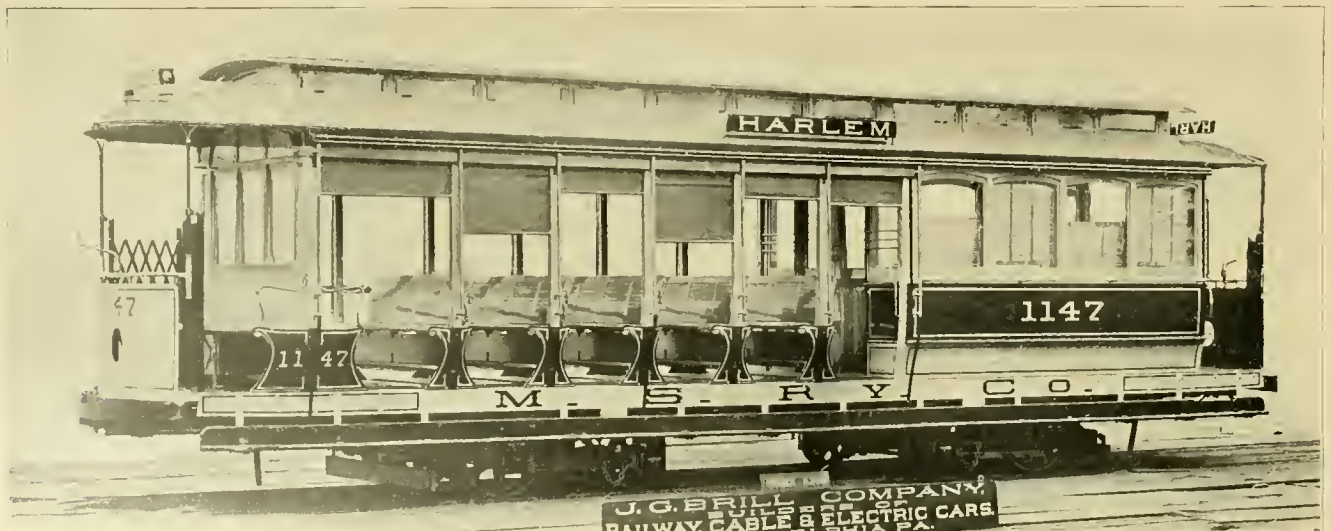
All the floor timbers run through to the crown pieces except the sill next the step. This brings the platform level with the car floor and produces an exceedingly solid structure with a minimum

width at the widest points, 8 ft. 5 in.; length over the buffers is 51 ft. 8 in.; length of platforms, 4 ft. There are two steps with 13½-in. risers; the lower one is 18 in. from the head of the rail, making the total height to the platform 45 in. The buffers are of the Brill continuous angle iron pattern.

The cars are mounted on "Perfect" trucks (Brill No. 27); they have 33-in. wheels with a 6-ft. wheel base.

There are 26 cross seats with stationary backs. The seats are large and comfortable, and are spaced 2 ft. 8 in. The car will seat 54 persons including the platform seats. There are 12 windows or openings on each side which may be closed by spring roller curtains. Telephone boxes and annunciators are provided, the road being operated on telephone orders.

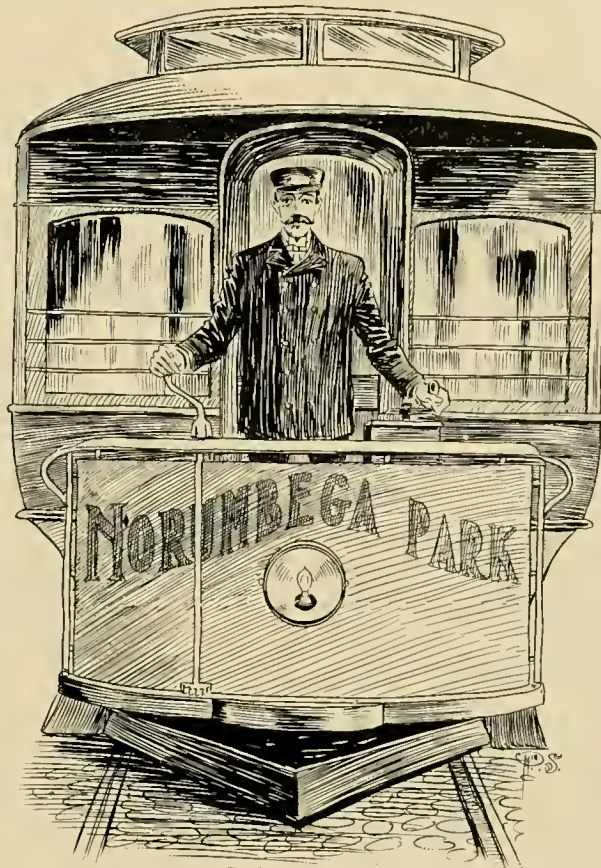
The Metropolitan Street Railway, of New York city, is now putting in service a number of cars built by the J. G. Brill Com-



COMBINATION CAR—METROPOLITAN STREET RAILWAY, NEW YORK.



*This is one of the oldest and most competent motormen on the Commonwealth Avenue Street Railway Line. . . .*



*He states that he is always "thankful that his cars are equipped with WHEELER HEADLIGHTS" That they are the "brightest, the lightest, and that they light ahead farther than any other"*

*And that he feels "perfectly safe on the darkest nights with these headlights."*

*See them on hundreds of suburban cars, at the exhibit hall, or at our office, 24 Washington St., Boston.*

*WHEELER REFLECTOR CO.*

pany which are of a novel type. Their introduction upon a road handling such a heavy traffic will be watched with interest. The principal reason for the adoption of the combination type, a modified California car, is the order of the board of health which provides that one car in every four shall be closed.

The general type is shown in the engraving. The closed body is of the same style as the standard closed car of the road but shorter. The open portion is of the same character as the open cars which the company is using.

The new combination cars are 35 ft. 11 in. over the crown pieces. The width over all is 7 ft. 2½ in. The rear platform is 3 ft. 6 in. long, the forward platform, that on the open end, 3 ft. 8 in. There are five reversible seats and two stationary, one of the latter being outside the bulkhead. There are folding steps on each side like those on the ordinary open cars but contrary to the usual practice these are carried the full length of the car, and give the conductor means of reaching the open portion from the platform at the opposite end without passing through the closed body, a hand rail being provided on the body for the conductor to take hold on. The top of the sill is 33 in. from the head of the rail which gives a rise of 18 in. to the first step and 15 in. from this step to the floor of the car. The step is but 3½ in. higher than the step of a closed car, and the floor of the car is carried 1½ in. lower than that of the ordinary cars.

The closed compartment is 11 ft. 2 in. over the corner posts and has longitudinal seats covered with Wilton carpet. There is space on the seats for 14 persons. The open portion of the car seats 35 making the total seating capacity 49. White ash slat seats and backs are used in the open part. The finish in the closed compartment is ivory ash with wavy maple headlinings.

ESTABLISHED 1848.

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CABLES.

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542 The Rookery, CHICAGO.

507 Security Building, ST. LOUIS, MO.

The cars are mounted upon "Eureka" maximum traction trucks with 30-in. driving and 20-in. pony wheels. The total wheel base of the car is 17 ft. 6 in., and that of the trucks 4 ft. There are two G. E. 1000 motors.

Outside the cars are finished in the standard cream and orange of the road. The ornaments and lettering are of aluminum leaf. The open portion of the car roof is provided with a gutter which has a dip at each end and in the center, the water coming down through the grab handles and being carried away below the running board by an extension pipe.

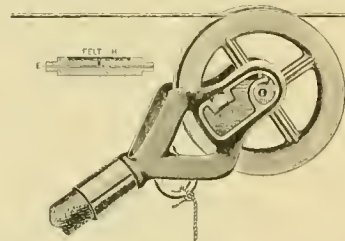
It is thought that these cars can be run the year round and thereby accommodate smokers in the winter. Several roads have deemed this idea practicable and have ordered sample cars for the purpose of testing it.

### IMPROVED EXCELSIOR SELF-OILING HARP.

The International Specialty Company, of Detroit, Mich., within the past few months has been introducing on many of the large electric railways of the country a self-oiling trolley harp, which has been described in the REVIEW.

Owing to the many different conditions in wiring and switches which have been met, the form as originally made was not practical under all conditions. A change has been made in the form, overcoming every objection that has presented itself, and the harp, as shown in the accompanying illustration, is a thoroughly practical device.

The form is almost identical with the harps now in use. The



wheel is so protected that the motorman cannot in any way get the wheel on top of the wire; and under the lowest bridges, the overhead wire cannot rub on any part of the harp. The chief claim made by the manufacturers are that there is a large saving of oil; the

axle being constantly oiled preserves the standard graphite bushings now in use; there being little wear and hence no vibration, the wheels will last much longer.

The oil will not fly off the lub from centrifugal motion, proper flanges protecting the same. The principal trial has been on the Rapid Railway of Detroit, which has cars with double 75-h. p. motors geared for a speed of 50 miles per hour, and the report of this road after a 30 days' trial was that with one oiling they made a run of 7,652 miles without refilling cups and with no indication of wear on any of the parts of the trolley harp.

This harp will be on exhibition at the Boston convention and can be seen at the exhibit of Charles N. Wood. The company will be glad to give further information and send circulars to those desiring them.

The American Impulse-Wheel Company, of 120 Liberty street, New York, has published a very attractive catalog, illustrating and concisely describing the Cazin impulse-wheel of the type commonly known as "hurdy-gurdy." Figures are given for different styles of turbines and water motors. The Lombard governor, for regulating the speed of the water wheels and the one recommended for the larger sizes, is also shown. This company is prepared to furnish not only water wheels, but pipe, belting, valves and other accessories for large water power plants furnishing current for large transmission and railway purposes.





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H. H. WINDSOR,  
Editor.

F. S. KENFIELD,  
Business Manager.

### CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

### DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

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VOL. 8. SEPTEMBER 15, 1898. NO. 9

Prior to this year the Association was bound by an iron-clad by-law which designated the time of its regular meetings as the third Tuesday in October, which the same it always religiously obeyed and in consequence gave the delegates and supplymen some bad days on several occasions when the weather man sent an early winter, and no means were available for efficiently heating the convention and exhibit halls. After agitating the matter of so amending the by-laws as to permit the time of meeting to be chosen earlier or later, according to the latitude and climate of the convention city, the Association at the Niagara Falls meeting amended Article VII so as to read "between September 15 and December 15 of each year," instead of "the third Tuesday in October."

Everyone applauded the change because for the last three years October has been uncomfortably cold—an even stronger word would be more applicable to Montreal. It was not anticipated, however, that, after being given so much latitude in selecting the date, the Executive Committee would be obliged to execute a "conp" and hold the meeting 10 days earlier than the limit. But such was the case, the early date being obligatory because a suitable hall could not be secured in Boston at the time wished. The convention was not "legally" the regular meeting but by a unanimous vote the convention decided to consider it so, as will be noted in the proceedings.

The weather, after the morning of the second day, could not have been more perfect, and had the meeting been held a month later we feel sure that the sea breezes would have been found to detract from the pleasure of the excursions, rather than add to it, as was the case.

We heartily approve of giving the Executive Committee full power in choosing the meeting time, and think that this year's experience shows that a mistake was made in imposing the conditions, which it has been found necessary to violate.

The supplymen were better housed than ever before, and for the first time everyone got all the space he asked. The result of this was that the exhibits were not crowded together, as at previous conventions, and greater opportunity was afforded for the artistic arrangement of the apparatus and goods shown. The exhibitors took advantage of this and gave us a display that we believe has never before been equaled at our conventions.

Does it pay the supplyman to place an exhibit at the convention? Everyone of them with whom we talked at Boston said that it does pay in one way or another. In several instances nearly all of the apparatus shown was sold before the convention closed, and we were advised of several large orders taken, though exhibitors do not, as a rule, expect to get many orders at the conventions. As one gentleman expressed it: "We don't do any business here, but I shall hear of enough new business to keep my salesmen busy for the next six months; and it is the exhibit which brings me in contact with these men who are to be in the market in the near future."

The topics discussed at the Boston meeting were all timely, as evidenced by the discussions.

In Mr. McCulloch's paper on single and double trucks were presented data on the very points which the manager about to invest in new rolling stock for use under conditions where he has a choice of either kind, is anxious to know. In discussing this paper Mr. McCormack, of Brooklyn, said: "The double truck cars increase the patronage to such an extent that we have had to shorten the headway." This statement was made as apropos to the claim made for double truck cars that their use enabled the headway to be lengthened. If all managers could be assured that they would have the same experience as Mr. McCormack, the double truck would be the one to use.

Mr. Dimmock's paper on street railway mail service and the animated and interesting discussion which followed make it evident that the Association here has a splendid field to do some work of great benefit to the street railway interests. We believe that Mr. Sergeant reached the meat of the mail compensation question when he said that Congress needed enlightenment, and did not fully comprehend the possibilities of the street railway mail service. The able committee appointed to consider this question will, no doubt, accomplish results of value.

Mr. Hopkins' paper is one which will receive the careful attention of those having to do with the care and repair of electric cars.

In treating of pleasure resorts Mr. Holmes gave his experience in Kansas City, and laid before the convention the details as to one set of the "local conditions" which, to so great an extent, determine what a street railway shall do in the amusement line. Mr. Holmes quoted Gen. Hancock's statement of the tariff question as applicable to this subject, and from the remarks of some of the gentlemen who discussed the paper, we infer that they regard Gen. Sherman's definition of war as also applicable.

Mr. Perkins presented an able paper on the inspection and testing of electrical car equipments, and it is to be regretted that the lateness of the hour prevented a general discussion, as it is one which greatly interests the practical man and doubtless valuable data would have been thus placed on record.

We believe that a more valuable paper than that of Mr. Conant has never been presented before the Association. It is a paper so full of meat and so technical that it was idle to think of submitting any discussion of it at the meeting after merely hearing it read. It is a cause of regret that the policy of the Association does not permit the technical papers, at least, to be

printed and sent to the members in advance of the meeting, for in that event opportunity would be given to submit discussions of them which could not fail to be of interest.

At no previous convention have the entertainments and excursions provided for the visiting delegates been better managed or proved more enjoyable. The hosts at Boston were the members of the Massachusetts Street Railway Association, and under the management of the committee on entertainment, ably directed by its chairman, P. L. Saltonstall, of Boston, they arranged a number of excursions which will henceforth constitute a standard, and, we fear, a hard one to surpass.

Only three delegates were present at the Boston meeting who were participants in the organization meeting, seventeen years ago. The new faces each year testify to the constant change in attendance, and comparatively few are left of the "happy family" of old horse car days, when the same ones could be confidently counted on each year. With the change to electricity the gathering has become just as distinctively one of young men, as the gray heads predominated up to that time.

We notice each year a steadily increasing attendance on the part of heads of departments, such as chief engineers, master mechanics and head electricians. Time was when the conventions were for executive officers and held little of interest for the other departments. That is rapidly changing and we are confident that no company will fail to get large returns on the money spent in sending its men to the Boston meeting. These gatherings are fairly bristling with ideas and experiences and many of the best of them are never heard on the platform or published in the reports.

The mayor of Denver, who vetoed an ordinance for a line which the people wanted, has had the satisfaction of seeing it passed over his head with scarcely a dissenting vote. His position was unjust and untenable and unpopular and the rebuke will probably set him to thinking. The time had expired on a suburban line which has never paid, but had made heavy losses. Hundreds of workmen had bought little homes on this line because the land was cheap. One of the big companies offered to accept the road and run it if the franchise was extended. The mayor tried to hold up the road and would have seen the tracks removed and several hundred families lose their all, rather than yield.

Next year Chicago. We have no Lexington, or Concord, Bunker Hill, or in fact any hill at all, but we have a great big hearty welcome waiting, and it will not diminish in size as the months go by. The Chicago delegation had scarcely returned from Boston before the selection of committees was discussed, and by the time this reaches our readers a convention organization will be well under way. Chicago is central; its railroad facilities are the best in the world; we have plenty of good hotels, and hope to see not less than two thousand at the '99 convention.

The convention of the Accountants' Association was successful in every way, and the sessions well attended, notwithstanding the date was an unfortunate one for eastern men, with many of whom the fiscal year closes October 1. The membership is growing rapidly, and interest in the work constantly increasing. The committee on standardization have performed a most laborious work, in a highly creditable manner. A permanent collection of forms and blanks has been started, with a librarian in charge, and this will be made a valuable feature, accessible to all members.

The department devoted to law, under the head "Recent Street Railway Decisions," we have been compelled to omit from this issue of the REVIEW by reason of the reports of the three conventions, the A. S. R. A., the Accountants', and the New York State, taking so much space. The same is true of the Power House Department. Next month we shall endeavor to make up for this temporary deficiency.

Following closely upon the convention of the A. S. R. A. came the 16th annual meeting of the Street Railway Association of the

State of New York, which was held at Manhattan Beach, September 13 and 14. This organization is the most powerful and influential of the state associations and is but one year younger than the National. Its meetings are always well attended and papers of value to the industry are to be counted upon with certainty. This year was no exception, and we print in this issue several interesting papers read before the New York Association.

## THE BOSTON SUBWAY.

The \$5,000,000 subway interested strangers more than any other one thing, and well it might. Many visitors took the ride simply for pleasure. The through service from end to end was inaugurated only three days before the meeting, but no one would guess it had not been in operation for months. Indeed, so perfect were the arrangements that out of the 6,000 cars which passed through the subway on September 3, only one car was switched to the wrong track. Only those of our readers who have "done" the subway can realize what this statement means. At the Park street station from 5:30 to 6:30 p. m. the sight is wonderfully interesting. Cars on four tracks follow one another in a solid train, while the station platforms contain several hundred people. Four and five cars are loading on each track simultaneously and notwithstanding the army which pours down the broad entrances there is no confusion, though a great deal of bustle and hurry. It is the one place in Boston where the pedestrian forgets the dignity of his daily walk and participates in a real, genuine, western rush. "This subway is a mystery," remarked an elderly Bostonian, as she was directed how to transfer, and "mystery" is quite expressive to the stranger, though it is simple enough when one knows how. All the arrangements are perfect and the force of ticket sellers and starters is ample, and all the men are thoroughly qualified. The total length of subway is 1 2-3 miles, with 5 miles of track. Cars travel at a speed of 30 miles an hour. It was commenced March 28, 1895, and completely opened September 3, 1898. It is owned by the city and rented to the company.

## PENNSYLVANIA STREET RAILWAY ASSOCIATION.

The seventh annual convention of the Pennsylvania Street Railway Association will be held in Scranton October 19 and 20. The association will convene in the Board of Trade rooms on Wednesday, October 19, at 11 a. m. At this meeting the usual annual business of the association will be transacted, including the election of officers for the ensuing year.

Scientific papers on subjects of special interest to the association will be read and discussed and methods for the promotion of the general interest of street railways will be considered. On the second day a series of entertainments will be provided for the members and visitors of the association, including an excursion over the lines of the Scranton Railway Company. An interesting programme has been arranged and will, in due time, be published and mailed to members of the association and street railway people generally throughout the state.

All street railway companies in Pennsylvania are eligible to active membership and all manufacturers or dealers in street railway supplies are eligible to associate membership in the association, the membership fee in each case being \$25. Those desiring membership with the association can acquire the same at once by remitting membership fee to S. P. Light, secretary, Lebanon, Pa. Members of the association are urged to send as many representatives as possible to the convention, and those who have not yet joined are also cordially invited to attend and participate in the exercises and entertainments of the seventh annual meeting.

The headquarters of the association will be the Hotel Jermyn, the rates of which are \$2.50 per day and upwards; other hotels and rates are: Hotel Rudolph, \$2.00; Hotel Terrace, \$2.00; Scranton House, \$2.00; St. Charles Hotel, \$2.00, and Westminster Hotel, \$1.50 per day.

All communications should be addressed to S. P. Light, secretary, Lebanon, Pa.



## THE BOSTON CONVENTION.

**A Grand Success—The Seventeenth Annual Meeting Combines Pleasure with Work—Facilities for Sessions and Exhibits Unusually Good—Fine Weather—Large Attendance, and Bostonians Are Most Generous Hosts—Next Year, Chicago.**

Boston proved an ideal place for the convention, and Boston people by a variety and completeness of entertainment which could not have been improved upon, made a never-to-be-forgotten impression on her visitors. The weather, which is always so important a feature in the success of the convention, was uniformly pleasant; for while the first day was a trifle mild, the heat was less intense than in most parts of the country, and the second day brought a cool change which made going about a joy, and sitting in convention sessions less exhausting.

The convention was certainly a great success from every standpoint; the business sessions were well attended and full of interest; the exhibitors had nothing to ask; and the numerous entertainments were so varied charming and delightful, that the time was crowded to the limit with engagements. The ladies were specially attended to by local committees, and were on the go continually. The wish of every visitor was to remain longer, and all returned with regret that the stay must be so short.

The two Associations met simultaneously, the American in the Paul Revere Hall, and the Accountants' in the ladies' parlors on the same floor. Exhibits occupied first floor and basement, and while there were perhaps a smaller number of new devices than usual, nearly all exhibits showed improvement over a year ago,

We of the west are especially pleased that the Association should honor Chicago with its presence next year, and while the contrast between Boston and a city scarcely two generations old places us at a disadvantage, Chicago can promise a hearty welcome and a good time.

Tuesday, September 6.

President Lang called the meeting to order at 11 a. m. and announced Mayor Quincy, of Boston, who made the following

### ADDRESS OF WELCOME.

Mr. President and Gentlemen of the American Street Railway Association: It gives me a great deal of pleasure to welcome you to the city, and to express the hope that the deliberations of this large meeting of the American Street Railway Association may be both pleasant and profitable. The size of this gathering, the wide extent of the representation in this convention, the financial magnitude of the interests involved, affords a striking illustration of the rapid development which is taking place in the electric transportation interests of the United States. They have today won a position as one of the greatest—as one of the most important—interests of the country. Civilization really may be said to have had its inception with the first knowledge on the part of primitive man to command some form of transportation. Civilization begins when man acquires a power of transporting himself and of transporting goods, and civilization progresses as the command of mankind over the forces of transportation, beginning with transportation in its most primitive form, increases and grows.

One great revolution occurred when mankind learned how to handle the force of steam, and how to apply it to the great work of moving passengers and moving freight. But just as steam transportation had nearly reached its limit, just about as the means of steam transportation had been practically perfected, this new force of electricity makes its advent upon the scene and it, too, is harnessed in its performance of the work of civilization; and instead of becoming directly, at any rate, a rival of steam, this comparatively new force of electricity finds its application, so far as transportation is concerned, upon different lines. While these lines may hereafter extend, making electricity directly a rival of steam, for many of the purposes for which steam is used, up to the present time steam and electricity have divided between them two somewhat different fields of transportation; and electricity has not yet displaced steam but has filled in a vacant part of the field. It has added to the facilities of transportation which the human race has possessed and it has supplemented in a more important respect the working of steam which is primarily applied to transportation over long distances, to the connecting together of states and cities at a distance from each other; it has supplemented that work by the only less important work of developing the inter-municipal and intra-municipal means of communication, and I think the economic and social results which are to follow from the development of the electrical street railway are only second in importance to those which have followed from those of the development of the steam railroad. I think the street railway has progressed far enough in its evolution, although it has by no means filled its full field in this country, or reached the limit of its usefulness—it has progressed far enough to enable us to see that it is an important agency in the promotion of civilization. It has immensely extended the movement of the people and very



C. S. SERGEANT,  
President-Elect.

and from the amount of time delegates spent in studying the display one may readily judge how important this feature of the convention has grown to be.

A detailed report of the doings of the American Association follows, and in another portion of this issue will be found a report of what the Accountants' accomplished.

The Association is in better financial condition than at any time in its history, and its management has greatly improved during the last few years. President Lang made an admirable presiding officer, and the faithful work of Secretary Penington was appreciated.

The election of C. S. Sergeant, of the Boston Elevated Railway, was a well deserved compliment to that gentleman, to his company and to the city. He possesses every qualification for a presiding officer, and will fill the president's chair with dignity and discretion.

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largely that class of the population who do not travel long distances over steam railroads. It has brought the railway system into the small communities. It has connected the village and the town with the larger city and with other villages and towns by a network of secondary communications, and it has, through these facilities increased in a very important degree the facilities of civilization. For what does civilization consist of except in the command of mankind over the forces of nature, and in his increased ability to make all the forces of nature subservient to his own good and in man's increased ability to transport himself wherever he may choose to go. Life consists of action, and the more we increase the facilities on the part of mankind to move its individual units from one point of the earth's surface to another point, the more we extend civilization in the higher sense of the term.

Electric railways tend to bind together the various cities and the various towns and the various communities into which mankind is divided into a great unit of communities, all of which understand each other better through the new facilities and cheap facilities for moving about, which have been brought to the world by this comparatively new agency of electricity. And so I am glad to welcome this convention today as representing a new and potent force which has come into the world by the advancement of mankind. For it seems to me that it is no exaggeration to say that the electric street railway in the stage of development it has reached in this country at least fulfills that position and is entitled to that recognition. Therefore, I am sure that it is profitable and advantageous for those who are engaged in different parts of this country in the practical administration of this new agency of civilization, in the practical control of this new force of electricity in making it subservient to the needs of man, to come together and compare notes and examine the progress that has been made in different places in the art and science of street railroading, and that they should confer about the problems, mechanical, electrical and financial which affect the business of street railroads more or less everywhere, and that they should come into personal contact with each other, become acquainted with each other, and gain that sense of comradeship and good fellowship which comes from being engaged in a common occupation.

I am confident that this street railway convention, the largest and most important, I believe, which has been held up to the present time, with its mechanical and electrical exhibits, and with the important matters which are to come before it for consideration, will accomplish something for the still farther progress of this great interest and this great industry. The people of Boston are always glad to welcome these national conventions. Boston has a great electric street railway system. Not only has she one of the very greatest and I believe one of the very best street railroad transportation systems to be found anywhere in the world, but we have, in the suburbs of Boston, in that chain of cities and towns which encircle Boston proper, which constitute Greater Boston, embracing as it does a million people or more within its limits, we have in these outlying cities and towns as well highly developed systems of suburban and of inter-urban street railway transportation. I am sure, therefore, that this Association could not have selected a better center in which to hold its gathering this year, in which to take account of the progress that has been made in electric street railway work during the last year, and in looking forward to the progress that is still to be made, than in this city of Boston. I can only wish that your visit may be pleasant as well as profitable, and I can only say in conclusion that if there is anything which the city of Boston, as a corporation, or the citizens of Boston individually, can do to make your stay here a pleasant one, I am sure that it will be very cheerfully done. I trust in your deliberations of the progress of the interests with which you are associated, you will find, as I know you will find, that substantial and material progress in the development of this great interest has been made during the past year; and that you will be able to see before you in the new prosperity, in the wave or period of prosperity which we all believe awaits this country during the next few years, that you may be able to see large returns in your street railway business and an inducement for the application of still

further capital and still further enterprise for the still greater and more extensive development of this beneficent agency of civilization. (Applause).

President Lang: Mr. Mayor, I am sure that I express the sentiments of this organization when I say that we are glad to be with you. On behalf of the members of this Association I tender to you our thanks for the very cordial welcome you have extended to us and for the interesting remarks you have made.

President Lang: The next order of business will be the calling of the roll. I will say that the executive committee has decided to make a departure in the method of calling the roll. We will consider the roll called by accepting the registration at the door as the evidence of the companies represented and the gentlemen who represent them. The next order of business is the reading of the minutes of the last meeting, and unless objection is made, the minutes will stand approved as printed. We will now give an opportunity to companies represented, that are not members of the association, to acquire membership.

The following companies then joined the association:

Elmira & Horseheads Railroad Company, Elmira, N. Y.

Portchester Traction Company, Portchester, N. Y.

Portland & Yarmouth Electric Railway Company, Portland, Me.

Portsmouth Street Railway Company, Portsmouth, Va.

G. B. Kerper, Dayton:—Mr. President, I desire to offer the following resolution:

Whereas, the executive committee of this association, at its meeting held in Boston January 25, and 26, 1898, owing to its inability to secure a proper hall for the annual meeting of the association at another time, issued its call for the meeting of the association to be held in Boston September 6-9, 1898.

Resolved, that the action of said executive committee be, and the same is hereby approved, ratified and confirmed, and this meeting is hereby declared to be the regular annual meeting of the association for the year 1898;

Resolved, that all of the business of the association be proceeded with at this meeting in accordance with the by-laws of the association applicable to regular meetings called and held within the dates provided by paragraph 7 of said by-laws.

The resolution was seconded by Mr. Hamilton, of Chicago, and was unanimously adopted.

#### PRESIDENT'S ANNUAL ADDRESS.

We are today, for the seventeenth consecutive year, assembled in furtherance of the objects of our association, under conditions most favorable to a pleasant and profitable meeting; for we are in the house of our father, the city of our birth.

As the presiding officer of the association, and in the name of the street railway men of Boston, I bid you a hearty, sincere and joyous welcome.

Amid the circumstances of this meeting, our thoughts naturally turn to the time, the persons, and the conditions existing when the association was formed. Some then present are with us today, and whether residents of Boston or not, certainly experience a pardonable pride in the growth and achievements of the association, as shown by its published proceedings and emphasized by the large number in attendance.

Of the Boston people who were present at the outset, Calvin A. Richards, president of the Metropolitan Railroad Company, now a part of the Boston Elevated system, was a conspicuous and active member. In 1884 he was elected president of the association, and those who knew him best feel a deep grief that death has robbed us of a member whose welcome, if present, would know no bounds.

As I trace this history of the association from its inception, I am convinced that its founders, in the words of Emerson, "built better than they knew," for is it not remarkable that they should have chosen a name and set forth in our constitution the objects of the association so wisely and well that no material change has been required to adapt them to present conditions, which are so radically different from those then prevailing.

The constitution then, as now, says: "The object of this association shall be the acquisition of experimental, statistical and



scientific knowledge relating to the construction, equipment and operation of street railways," etc.

The need for experimental knowledge in connection with a mule goes without saying, and statistical and scientific knowledge with reference to harness, cars or strap rails sounds very ancient as compared with engines, boilers, generators, girder rails, vestibuled cars, lightning arresters, ohms, volts, watts, amperes, etc., the familiar subjects of today. I do not mean, however, to belittle the value of the investigation, discussion and association of the earlier days, because there are too many veterans present (and I might myself be called one), who can testify to the great benefit derived therefrom. It does seem, however, that the necessity for holding meetings in different cities was greater formerly than now, for in order to know very much about what others had done or were doing we had to go to them, whereas now we can see almost everything in connection with our business in the room below, except the mercurial portion known as the state legislature, common council, tax gatherer and ubiquitous damage lawyer, so called.

That this is a fair inference is also shown by the records, for the second meeting was held in Chicago, which then, as now, claimed to be the metropolis of the West, but disputed by St. Louis. While it was doubtless an enjoyable meeting, Chicago was apparently too much of a shock to the nervous systems of our Eastern members, so it was determined to return East the following year, and New York was selected. Of course, New York never fails to interest, but there is one obstacle always difficult to overcome in meetings at that point, which is that one cannot remain long enough to see it all. What the delegates failed to find there, however, they looked for the year following at St. Louis, and it proved so good that they naturally looked for more nearby, hence next sought out Cincinnati. Cincinnati, as was expected, proved to be ideal, but the East offered so many attractions in the contest for location that Philadelphia captured the convention following.

Dignified and made bold by the Philadelphia meeting, the cry became, "On to Washington." The pleasure and profit of that meeting cannot be doubted, but the West was evidently becoming jealous, and to secure another meeting played its trump card and Minneapolis won out. It goes without saying that this meeting was profitable to the association as well as to the good people of Minneapolis. Electricity as a motive power was at that time so far advanced that all knew it was bound to come. Its discussion consumed nearly all the time of the meeting, and we left the Minneapolis people more strongly impressed than ever before that they had made no mistake in adopting electricity as a motive power and that they wanted still more of it.

In journeying to Buffalo the following year the association was well repaid, for much progress along electrical lines was found, and it undoubtedly stimulated the movement further in this direction, hence a dash was made for Pittsburg the following year. No one will ever forget that great concern, the Westinghouse Electric and Manufacturing Company, which was then and is still so energetic and progressive in the electrical field, and which proved to be such an interesting feature of the meeting.

In going to Cleveland for our next meeting, we did wisely, for we there found roads and power houses further advanced towards the goal of perfection than could perhaps at that time have been found at any other place in the country. At the Milwaukee meeting the year following we were met with the most extensive display of electrical apparatus witnessed up to that time, presided over by scores of ever-watchful, energetic and intelligent supplymen, and our meeting proved to be unusually profitable. By this time we were all so firmly established on the electrical foundation that to see an electric road or inspect electrical appliances was no novelty, but, still searching for greater things, we turned towards Atlanta. We not only found a great exposition of the products of the country here assembled, but very much in the electrical line to interest us. The cordiality of our reception by the people was a crowning feature of this meeting.

In turning our steps toward Montreal a year later, we endeavored to give of the good things we had seen and experienced at former meetings, and to acquire further knowledge from our

Canadian brothers. It was the first attempt at holding a meeting beyond our borders, and for various reasons was slimly attended; still it was not void of profit, for it revitalized the association to such an extent that the meeting at St. Louis the following year was unusually interesting and valuable. Having had a foretaste of the place we, of course, were eager to return, and our reception by the people could not have been more cordial. It was left for Niagara Falls, however, to overshadow what up to that time had been considered great, and to reveal to us the vast in electrical units and in nature. We also found the manufacturers and supplymen present in abundance, and our meeting there was voted a success in every particular.

I have thus briefly recounted our movements and spoken of the motives which it has seemed, from the best information at hand, prompted the association in selecting its places of meeting, and the value of such selections and other reasons why the association has grown to its present proportions and standing. Its growth and experiences, like all such organizations, have not been without some severe trials, but unlike the prodigal son, we have wasted none of our substance in riotous living, but have improved at each successive step, and now reach home; not only the birth place of the association, but the home of the electrical industries in a larger sense, perhaps, than any other locality in the world. The people of Boston not only furnished money with a lavish hand to carry forward the work of developing the subtle power now so useful to us and all mankind, but also much of the brains and energy needed to make its use practical. Of this fact one circumstance will bear witness, and it is that C. A. Coffin, a Boston man, is still retained at the head of the largest electrical manufacturing corporation in the United States, if not in the world.

Having laid in this city the foundation of the splendid structure we have since reared, it is very proper that we should return and dwell therein for a few days. Everything gives a promise of this being the largest meeting in our existence. If we do not make it one of the most valuable, the fault will be with ourselves. Let us hope to leave such an impression that the Boston people will say: "It was good to have them with us."

In the growth and development of our association and the business we represent, let us not forget the priceless and unrivaled assistance rendered by the technical press. Without a spokesman, a guardian ever faithful to our interests as they have been, our progress would have been much slower and our pathway exceeding rough. All honor to these devoted publishers and editors.

Nor must we for a moment forget (if we could) the indefatigable supplyman, for he is the noblest Roman of them all. It is his courage, foresight and energy in taking up the new and useful article, and pressing it upon our attention, that helps to effect economies. We may sometimes be prematurely persuaded, but that is not the fault of the supplyman; it is simply one of the arts of his trade necessary for us to learn. But, seriously, without them the meetings of our association would be materially weakened and lost much of their interest and value. Let us then not fail to give them and their exhibits all the attention and examination time will permit.

The executive committee has prepared a very excellent list of papers to be read, and I trust that all will join in giving them generous discussion. Some of the writers of the papers have told me that they expected more benefit would be derived by members from discussion than from the paper itself. This should be inducement enough to keep all in constant attendance. Bear in mind that in so doing we are also promoting the best interests of the association, as well as honoring the writers of the papers, which is their due and our duty. While on this subject, let me here call attention to the necessity of having at our meetings papers which will interest all the members—not only the mechanical and electrical engineers, but the general managers and even presidents of companies. We need all these officials with us at every convention, hence we must provide something of interest to them.

Each and every member must be made to feel that he has been benefited by attending our conventions, and likewise the company represented, or our association will cease growing. As a

result of our deliberations economies should follow without injury to the public service, all of which will tend toward a further realization of the objects of our association which are "the establishment and maintenance of a spirit of fraternity among the members" and in the largest degree "the encouragement of cordial and friendly relations between the roads and the public."

Under the head of general business, as provided in our by-laws, or at some other appropriate time, a sort of experience meeting or informal discussion of all subjects relating to our business should take place, where each member shall feel free to ask any question that occurs to him upon which he desires information, and some one stand ready to answer

I venture to suggest a few subjects arising almost daily, where in this way very helpful information could be obtained, viz.,

"The Suburban Railroad; on what terms and conditions should they enter over our tracks and how can their building be encouraged?"

"The issuing of transfer checks or tickets and how abuses connected therewith can be limited."

"The equipping of buildings with automatic sprinklers and the economy resulting therefrom."

"The cast or electric welding of rail joints, and the saving effected in current and cars."

"The discussion or agitation of municipal ownership of franchises and the most intelligent way to treat the subject."

"To what extent companies should engage in the amusement business and the best methods of conducting the same."

"A comparison of the cost of materials and supplies and expenses of operation."

"How best to promote the interests of employes and in return secure from them the highest degree of service and loyalty."

These and many other subjects of kindred nature considered in this manner would awaken great interest

I desire to call attention to our fellow workers and associates, the Accountants' Association, which hold their meetings simultaneously with ours each year, and are even now in session in another part of the building. The whole business of the street railway revolves around the accountant's office, and many of us can attest the value of having efficient persons in charge thereof. It is with the hope of enabling them to make their services more valuable to their respective companies that the association was formed, hence they should receive every assistance it is possible for us to render. I bespeak for them your cordial co-operation.

In closing I wish to thank our efficient secretary and the executive committee for their cordial aid and support during the year, and to assure the members of the association of my great appreciation of the honor of being called a year ago to the office of president.

Mr. McCormack (Brooklyn): Mr. President, I move that the members of this association give a rising vote of thanks to the mayor of Boston for his kind address of welcome to this association. Carried.

The President: The next business in order will be the report of the executive committee, which will be read by the secretary.

Secretary Penington then read the minutes of the meetings of the executive committee during the year, the principle features of which were as follows:

Authority to pass on papers to be read shall be vested in the president and secretary.

That allotment of banquet tickets be two to each member company where two delegates are present, and one ticket for member companies sending but one representative.

That writers of papers be requested to limit their reports to 30 minutes.

Members two years in arrears for dues to be reported to the association.

To recommend for adoption by the association the following rules of order:

1. No member will be recognized by the president unless he shall announce distinctly his name and address.

2. Speeches will be limited to 10 minutes unless the time shall be extended by the convention.

3. Members who desire to offer resolutions or other matters to be considered by the convention are requested to submit them in writing over their signatures, to the secretary.

Mr. Ely offered the following resolution, which was adopted by the Committee:

Pursuant to authority conferred upon this committee by the convention of 1897, an investigation of the question of Municipal Ownership has been instituted, and in response to inquiries sent out by the secretary, much valuable data and information upon the subject has been secured. But owing to the extent of the field necessary to be covered, and also to the desirability of absolute accuracy in the evidence to be presented, and in order that the form of its presentation shall be such as to order of arrangement, conciseness of detail, etc., as to render the same of the greatest value, it has been thought best to ask for further time in the matter and your committee would therefore recommend that the subject be left in the hands of the committee until the next annual convention, and in the meanwhile any member so desiring may have access to the data in the possession of the secretary in its then existing form.

It was made a matter of record that for the first time in the history of the Association, every officer and member of the Executive Committee were present at the meeting September 5-6, in Boston.

Mr. Hamilton (Chicago): I move that the report of the Executive Committee be received and approved; and the recommendations presented be concurred in, and that the thanks of the association be extended to the officers and Executive Committee for the very able manner in which they have conducted the business of the association for the past year.

The President: We will now listen to the report of the secretary and treasurer.

#### REPORT OF THE SECRETARY AND TREASURER.

Cash on hand October 18, 1897.....	\$2,931.48	
Receipts to August 25, 1898.....		
Annual dues .....	\$4,131.67	
Membership fees .....	300.00	
Space, exhibit hall, 1897.....	1,727.50	
Space, exhibit hall, 1898.....	217.00	6,376.17
		<hr/>
		\$9,307.65
Expenses to August 25, 1898		
Printing and stationery.....	1,257.67	
Postage .....	198.58	
Salaries .....	1,500.00	
Miscellaneous expenses .....	25.00	
Executive committee, 1898 .....	360.90	
16th annual convention, 1897.....	1,920.74	
17th annual convention, 1898.....	388.48	5,651.37
		<hr/>
		3,656.28
		<hr/>
		\$9,307.65

Chicago, August 25, 1898.

I hereby certify that the balance due the American Street Railway Association on the books of the Continental National Bank of Chicago, at the close of business on the 24th day of August, 1898, was three thousand six hundred and fifty-six and 28-100 dollars (\$3,656.28).

(Signed) Ira P. Bowen,

Assistant Cashier Continental National Bank, of Chicago.

#### MEMBERSHIP.

October, 1897 .....	161
New members to September 1, 1898.....	17
	<hr/>
	178
LOSS.	
Withdrawn .....	9
Consolidation .....	8
	<hr/>
Membership September 1, 1898.....	161



NEW MEMBERS.

Anderson, Md., Union Traction Company.  
 Atlanta, Ga., Atlanta Railway Company.  
 Baltimore, Md., Baltimore Consolidated Railway Company.  
 Binghamton, N. Y., Binghamton Railway Company.  
 Brooklyn, N. Y., Nassau Electric Railroad Company.  
 Buffalo, N. Y., Buffalo Traction Company.  
 Chester, Pa., Chester Traction Company.  
 Cleveland, O., Akron, Bedford & Cleveland Railroad Company.  
 Colorado Springs, Col., Colorado Springs Rapid Transit Company.  
 Middletown, N. Y., Middletown-Goshen Traction Company.  
 Pittsburg, Pa., Union Traction Company.  
 Saginaw, Mich., Union Street Railway Company.  
 Sioux City, Ia., Sioux City Traction Company.  
 Spokane, Wash., Spokane Street Railway Company.  
 Wakefield, Mass., Mystic Valley Railway Company.  
 Wakefield, Mass., Wakefield & Stoneham Street Railway Company.  
 Webb City, Mo., Southwest Missouri Electric Railway Company.

WITHDRAWN.

The following members have withdrawn:  
 Atchison, Kan., Atchison Railway Light & Power Company.  
 Buffalo, N. Y., Buffalo, Bellevue & Lancaster Railway Company.  
 Chicago, Ill., Cicero & Proviso Electric Railway Company.  
 Middletown, N. Y., Middletown-Goshen Traction Company.  
 Montreal, Can., Montreal Park & Island Railway Company.  
 New York, N. Y., Dry Dock, East Broadway & Battery Railway Company.  
 St. Paul, Minn., Twin City Rapid Transit Company.  
 Terre Haute, Ind., Terre Haute Electric Company.  
 Cincinnati, O., Cincinnati Inclined Plane Railway Company.

LOSS BY CONSOLIDATION.

Baltimore, Md., Baltimore Traction Company.  
 Baltimore, Md., City & Suburban Railway Company.  
 Pittsburg, Pa., Alleghany Traction Company.  
 Pittsburg, Pa., Central Traction Company.  
 Pittsburg, Pa., Duquesne Traction Company.  
 Pittsburg, Pa., Pittsburg Traction Company  
 Pittsburg, Pa., Pittsburg, Alleghany & Manchester Traction Company  
 Pittsburg, Pa., Second Avenue Traction Company.

DUES UNPAID.

Detroit, Mich., Wyandotte & Detroit River Railway Company .....	\$ 25.00
Great Falls, Mont., Great Falls Street Railway Company.....	50.00
Kalamazoo, Mich., Citizens Railway Company.....	50.00
Lock Haven, Pa., Lock Haven Traction Company.....	25.00
Newburyport, Mass., Newburyport & Amesbury Railway Company .....	50.00
Oil City, Pa., Oil City Railway Company.....	25.00
Steelton, Pa., Middletown, Highspire & Steelton Railway Company .....	50.00
West Superior, Wis., Superior Rapid Transit Company...	50.00
	\$325.00

SPACE CONVENTION 1897 UNPAID.

Diamond Truck & Car Gear Company, New York.....	\$60.00
Graham-Woodward Equipment Company, New York.....	10.00
D. H. Long, Buffalo.....	5.00
Skeen Electric Signal Company, St. Louis.....	20.00
	\$95.00

Mr. Radel (New Brunswick): I move that the report of the secretary and treasurer be received and adopted. Carried.

The President: We will now take up the committee reports. The first paper is:

## COMPARATIVE EARNINGS AND ECONOMY OF OPERATION BETWEEN SINGLE AND DOUBLE TRUCK CARS FOR CITY USE.

By Richard McCulloch, Electrical Engineer, Cass Avenue & Fair Grounds and Citizens' Railway Companies, St. Louis, Mo.

Before beginning a discussion of this subject, it would be well to define what is meant by single and double truck cars, as these terms are often very loosely used. In this paper a single truck car will mean one in which the body rests upon a truck, the axles of which are parallel with one another and at all times perpendicular to the center line of the car. In a double truck car the body is pivoted upon two independent trucks, each of which swings underneath the body with perfect freedom. Fig. 1 is a photograph of an ordinary single truck, and Figs. 2 and 3 show different forms of double trucks.

Double trucks for electric cars are of comparatively recent adoption. All of the early electric cars were equipped with single trucks and in this, horse car and cable car practice was followed. As the single truck was first on the ground, and at present largely has possession of the field, it will be assumed that in this case of the double truck versus the single truck, the double truck is the plaintiff and must submit the weight of evidence.

Double trucks were first applied to cars in the desire to use longer bodies than has been customary. In the use of a single truck the best practice has been to limit the wheel base to about 7 ft., as a greater distance than this would cause the wheels to bind in curves. Assuming that the body of the car is 20 ft. long and that the platforms project 4 ft. beyond the body, the end of the platform would overhang the axle 10½ ft. This is as great an overhang as is customary, although single truck cars have been built with bodies longer than 20 ft. In this case it is necessary to provide extension springs on the trucks to check the oscillation of the car body. With a very long car body, however, the oscillation is not entirely overcome by this device, and the rocking becomes very disagreeable to passengers and very disastrous to the car and track. Twenty-two feet may be arbitrarily established as the limiting length of the body of a single truck car, and if we wish to use car bodies longer than this, we must adopt some truck which will avoid oscillation and which will pass around curves without undue use of power. The double truck accomplishes this, and it was to enable longer bodies to be used that it first came into use.

The truck which was first used for long street railway cars was an adaptation of that used by the steam railroads. This truck contains four wheels of equal size, and is pivoted over the center. It was soon discovered that for street railway use, this form of truck had two very objectionable features: first, that the floor of the car must be high enough above the rail to allow the wheels to swing freely under the car; and, secondly, the motor being geared to one axle of the truck, only 50 per cent of the weight of the car was available for traction. The latter is a serious objection on roads having grades.

From what has been said it will appear that the single truck is the truck for short cars, and the double truck is the truck for long cars. Therefore, a discussion of the relative merits of these two types of trucks will involve a discussion as to the relative merits of long and short cars. Also, as it is customary to supply long cars with cross seats and short cars with longitudinal seats, we have instead of the comparatively simple subject of single trucks versus double trucks, which has been assigned to your committee, the more complicated struggle between the short car with single trucks and longitudinal seats, and the long car with double trucks and cross seats.

It will be assumed in the discussion which follows that the road possesses the characteristic city travel, a load curve of which is shown in Fig. 4. It will be noted that two very pronounced peaks occur in this load curve, one in the morning from six to nine and the other in the evening from five to seven. It is at these times that the capacity of everything is tried, while

Richard McCulloch was born in St. Louis county, Missouri, in 1869. His education was received in the public schools and Washington University, of St. Louis, taking the degree of mining engineer in 1891. While in college he worked in every department of street railway business during vacations and at odd times. Mr. McCulloch was a member of the United States Geological Survey in Missouri, Arkansas, Indian Territory, Colorado and Montana. During 1891-92 a year was spent in the service of the Mexican National Smelting Company, and the next year was devoted to an expert course in the shops of the General Electric Company in Schenectady and Lynn. In 1893 he was appointed engineer of the Cass Avenue & Fair Grounds Railway, and since then has been the civil and electrical engineer for the consolidated management of the St. Louis, Citizens and Cass Avenue & Fair Grounds roads, of St. Louis, and has had charge of the electrical reconstruction of the Baden, Southwestern and Citizens Railways.



RICHARD McCULLOCH.

Louis, and has had charge of the electrical reconstruction of the Baden, Southwestern and Citizens Railways.

the load curves of all city roads resemble each other, it is evident that local conditions will to a large extent determine the kind of car which the railroad company will operate. Some of these local conditions are, the class of people who constitute the passengers, the location of the road with reference to the established lines of travel, the amount of pleasure travel received by the road, and the keenness of competition with other roads. The last is an important condition, because a road is sometimes forced to adopt certain measures for its protection which it would not adopt under any other consideration. In this discussion we will assume that it is to the interest of the road, even if no immediate competition exists, to use all reasonable endeavors to please its patrons, because this policy will render the road more ready to meet competition when it arrives.

Before the advent of the electric car, the horse car had become such an established institution in this country that certain standards as to track and rolling stock had become fixed. In the matter of rolling stock, the size of the car had always been limited by the ability of two horses to draw it. When a mechanical motive power replaced the horses, this limit disappeared, and almost the first improvement made in rolling stock was to in-

operation of larger cars cut down the number of cars, this account may be reduced in nearly the same ratio as the size of the car is increased. There are many other reasons why the size of cars has been increased, such as the increased volume of traffic due to the higher speed and enlarged territory of the street railroads, the greater comfort demanded by the traveling public, the increased power available for the operation of cars, etc., but it is probable that the present tendency toward the increased size of car bodies is with a view of operating larger units and fewer of them.

A line operating small cars seating 28 persons on a headway of three and one-half minutes would give the same service from a standpoint of seating capacity if it operated large cars seating 40 persons on a headway of five minutes. Manifestly, this latter service would be preferable from the railroad standpoint for the reason just given, and the question is, would the service be equally acceptable to the passenger? In this comparison we are assuming that the larger car is the more desirable vehicle in which to ride. Would the pleasure of the ride compensate the passenger for the greater length of time which he would have to wait? This is a question which must be solved by each manager for his particular road, as its correct solution depends largely upon local conditions over which he has no control. The scrutiny with which a passenger chooses a street car varies with the length of his proposed ride. If the ride is to be short, he takes the nearest car without reference to comfort; but if he is to ride a long distance, he will walk past several lines in order to choose that one on which he will have the most pleasant ride. The car question then becomes a more serious one, with long roads and with roads catering to a pleasure traffic. It has usually been accepted that on those roads having a purely business traffic, the proper car is the short one operated on short headway. The author, however, is of the opinion that even in this case the long car operated upon somewhat longer intervals would be desirable. It has often been observed that where a line operates two sets of cars, a passenger will allow several cars to pass him in order to patronize that type of car which suits him best. This has been observed even in the busy hours of night and morning when it would be fair to assume that passengers would be hurried and likely to take the first car which passes.

One of the most serious questions occurring in street railway

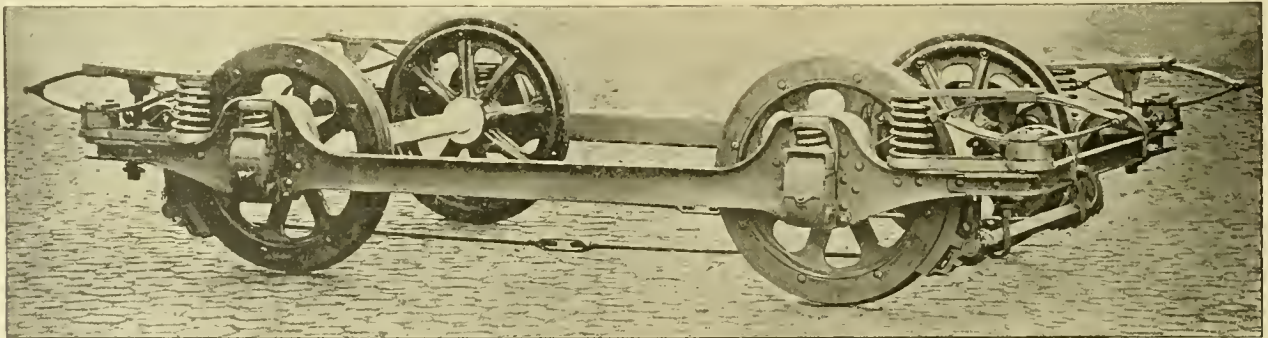


FIG. 1

crease the size of car bodies. Instead of bodies 16 ft. long, electric cars were built with bodies 20 ft. long, and now this length is being increased to 28 and 30 ft.

The expense of the average city road may be divided up as follows:

Maintenance of way and structures.....	4 per cent.
Maintenance of equipment.....	7 per cent.
Conducting transportation .....	52 per cent.
General expense .....	8 per cent.
Fixed charges .....	29 per cent.

It will be noticed that the item "Conducting transportation" is more than one-half of the total. This is largely made up of the wages of conductors and motormen and is proportional to the number of cars operated. Hence, it follows that if we may by the

practice is the problem of how best to take care of the rush of travel which comes morning and evening. With our present methods, there are only two ways of taking care of this travel: The first, by increasing the number of cars or units in service; and the second, by increasing the capacity of each unit. The latter method consists of attaching a trailer to the motor car, and where this is done, it is usual also to increase the number of units in service. On first thought there would seem to be no better method of increasing the capacity of a road than by the use of trail cars. They are easily attached and detached, they are in service only when necessary, and they do not require the assistance of additional train-men. An examination of the trailer system, however, will reveal the fact that it possesses serious defects. The trailer is not automobile and requires the services



of men and horses to attach it to the cars and to move it between the car sheds and the motor cars. The opening between the motor and the trail car increases the danger of accident both to passengers and conductors. The number of entrances and exits is increased and this augments the work of the conductor in

5. The use of trailers.
  6. The seating arrangements and convenience of exit and entrance.
  7. The preferences of passengers.
- These relations will as far as possible be reduced to a money

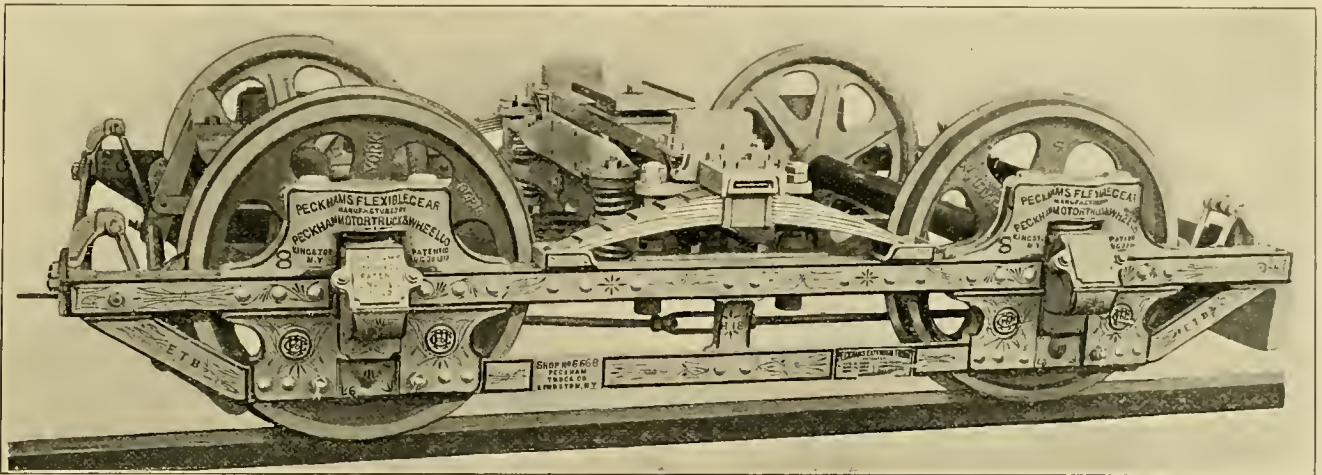


FIG. 2.

keeping track of his fares and increases the danger of his missing some of them. If an extra conductor is placed on the trailer to collect fares, a great portion of the gain due to the trailer system is lost. The use of trailers throws an additional stress on the motors, as a heavy weight is added to the train which is not available for traction. The trouble is intensified as the load on the trailer increases; it makes the train more unwieldy in handling, and is largely responsible for the difficulty in starting and stopping quickly and in making schedule time.

To obviate the necessity of using trailers, a large car equal in seating capacity to the combined capacity of the motor and trail car may be operated. This system, however, introduces the dis-

advantage of the operation at all times of the day of a seating capacity needed only during a few hours of the day. It also increases the size and weight of the cars and the average power required to operate them.

In order to compare the relative economies of single and double truck cars, their advantages and disadvantages will be discussed with reference to the following points:

1. Wear and tear on trucks.
2. Wear and tear on motors.
3. Power required.
4. Wear and tear on track.

which amounts to 26 per cent of the time, trailers are attached to these motor cars. Open trailers are operated in the summer months and closed trailers during the winter. The average seating capacity of the unit, estimating the trailer as a part of the car during the time that it is operated, is 35 seats, which approximates the seating capacity of the double truck car very closely. The motors in use on the single truck cars are W. P. 50.

The number of cars operated is obtained by dividing the daily car mileage by 115. It is necessary to do this because the average mileage per car on the two roads is different. The comparison is thus between 70 single truck cars and 47 double truck

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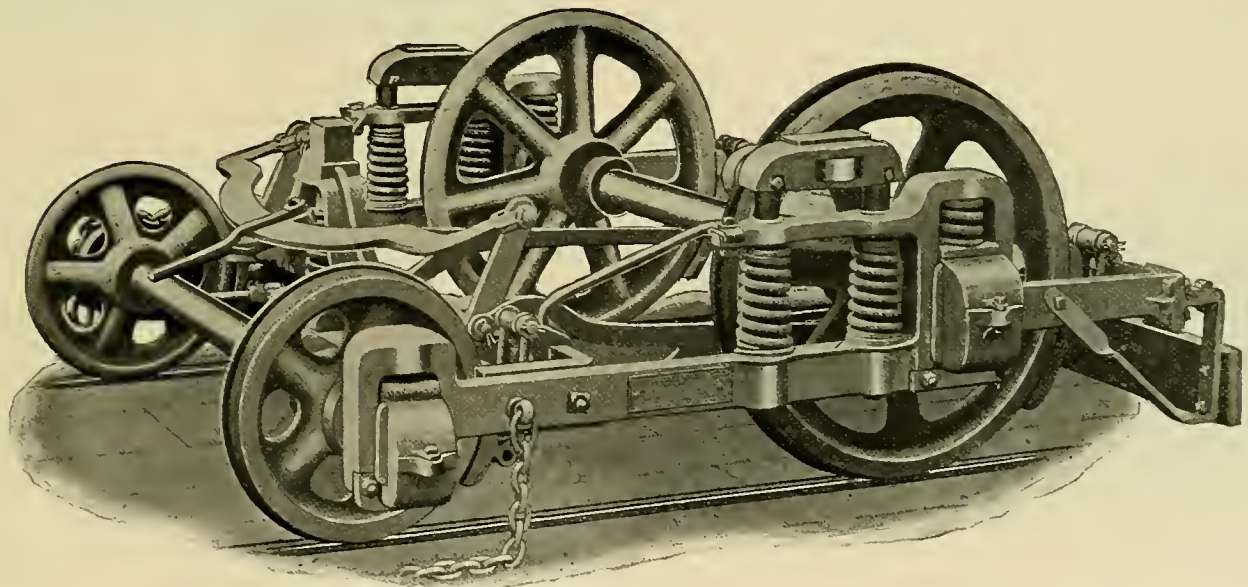


FIG. 3.

cars, each car making 115 miles per day. The road operating the double truck cars has the greater density of traffic. The single truck car with the trailer attached is shown in Fig. 6.

#### WEAR AND TEAR ON TRUCKS

It is evident that since a car equipped with double trucks has eight wheels and one equipped with single trucks has four, the

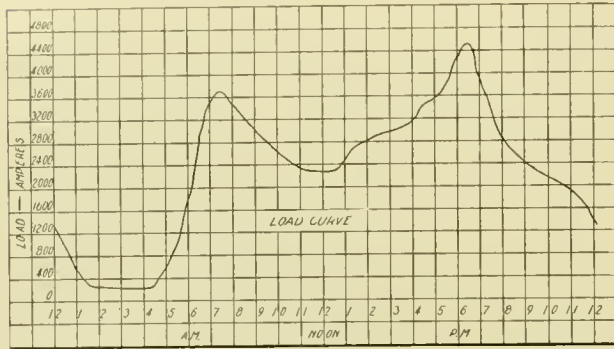


FIG. 4.

former will be the more expensive to supply with wheels. Table I shows the comparative replacement and cost of wheels and brake shoes on the two roads for one year. Table II shows the comparative cost of maintenance and repairs of trucks and motors for two years. It will be noted that while the cost per car is much greater on the road using double trucks, the cost per passenger is always the same. It would not be fair to assume from these figures that the cost of maintenance of trucks and motors per passenger is almost the same, no matter what sort of truck is used, because these figures result largely from the fact that in this particular case the double truck car carries the greater number of passengers, but an inspection of the table will emphasize the advantage of the large unit as compared with the small one. It will be seen by a reference to Table I that the greater part of the increased expense of maintaining the double trucks is due to the renewals of wheels and brake shoes.

In examining the relative strength of the various parts of



FIG. 5.

trucks, the side pieces may be compared to a beam supported at two points and carrying a concentrated load. The deflection of such a beam is proportional to the third power of the span; and in the analogy, the span corresponds to the wheel base of the truck. Therefore, the shorter the wheel base, the stiffer the truck side, and in view of its long wheel bases, it is evident that the single truck is at a disadvantage in this respect. For instance, a truck side where the wheel base is 4 ft. 6 in. is 3.76 times stiffer than a truck side of equal section where the wheel base is 7 ft.

#### WEAR AND TEAR ON MOTORS.

Table II, to which reference has already been made, gives the comparative expense of inspecting, repairing and maintaining the motors of double and single truck cars. As in the case of the trucks, it will be noted that while the expense per car is much greater in the case of the double truck car, the expense per passenger is nearly the same.

Table IV gives the relative weights carried by the different cars, when empty, seats full, and car crowded. It will be noted that while the percentage of weight available for traction in the case of the maximum traction truck remains constant, in the case of the motor and trailer it falls off as the number of passengers increases, and is especially small if the trailer is proportionately more heavily loaded than the motor car.

#### POWER REQUIRED.

Table III gives the power required to operate the different cars, and is the average of a long series of wattmeter tests. In making these tests, the wattmeter was placed on a car in actual service and allowed to remain through the entire day. An examination of the tables will reveal the fact that the power required for the propulsion of the car and the care and repairs which the motors demand are much greater in the case of the double truck

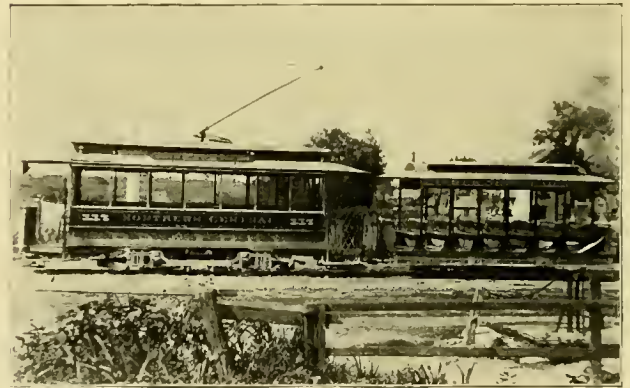


FIG. 6.

car. But if the number of passengers be taken into account, it is seen that the power and the cost of maintenance are roughly proportional to the number of passengers carried with either style of truck.

#### WEAR AND TEAR ON TRACK.

The wear of the rails of a street railway track is due to the grinding action of the wheel on the rail, and this is proportional to the weight on the wheel, but is intensified by the dirt on the rail, which causes the wheel to slip, and acts as an abrasive agent after the slipping has begun. The weak point of a street railway track, however, consists of the joints and the openings in the special work. The energy of the blow which the wheel strikes as it passes a low joint or a crossing is equal to the product of the weight of the wheel and the height of the drop. Therefore, on any given track both the wearing action of the wheel and the destructive action of the wheel are proportional to the weight which rests upon it. If the number of wheels under a car be increased, the number of blows which a low joint receives is also increased, but the intensity of each blow is diminished. Double trucks are at no disadvantage as compared with single trucks in this respect, unless the weight of the car be increased. Due to the shorter wheel base, double trucks go around sharper curves and go around the same curve with less output of power and less wear on the rail than single trucks. The double truck fell into disrepute when the maximum traction truck was first exploited on account of its liability to leave the track. This was due to the small amount of weight which was placed on the small wheels. It is now customary to place 30 per cent of the



TABLE I  
Comparison of the cost of wheels and brake shoes on Double and Single Truck Cars for the year 1907

	Average No. of Wheels used per car per year			Cost per car per year			Total Cost per Car per year per 1000 passengers	Wheel Mileage	
	33"	30"	24"	Wheels	Labor in Replacing	Brake Shoes		33"	24"
Double Truck Cars (47)	8 72		7 06	\$77 92	\$17 36	\$11 70	\$106 98	\$0 17	17,264
Single Truck Cars (70)	8 26	1 00		\$30 50	\$7 90	\$1 20	\$40 60	\$0 38	25,829

The Double Truck Car has four 33" wheels, four 24" wheels, and eight brake shoes.  
The Single Truck Car has four 33" wheels and four brake shoes.  
Average daily car mileage = 115.

TABLE II  
Comparison of the cost of repairs and maintenance of trucks and motors on Double and Single Truck Cars for the years 1906 and 1907.

	Average payments per Car per year	Truck Repairs		Motor Repairs		Total	
		Per car per year	Per car per year per 1000 passengers	Per car per year	Per car per year per 1000 passengers	Per car per year	Per car per year per 1000 passengers
Double Truck Cars (47)	226 00	\$181 00	\$0 80	\$318 00	\$1 41	\$500 00	\$2 21
Single Truck Cars (70)	141 00	\$410 00	\$0 78	\$186 00	\$1 39	\$596 00	\$2 17

G. F. 800 motors on Double Truck Cars  
W. B. 50 motors on Single Truck Cars.

TABLE III  
Comparison of the power required by Double Truck and Single Truck Cars -

	Average Watts	Average Watt hours per car mile	Average Speed Miles per hour	Average Watts per seat capacity	Average Watts per ton (car empty)	Average Watt hours per car mile per 1000 passengers
Double Truck Car Seats 36—Weight 11 75 tons. Average for the entire day	12840	1334	9 03	335	1025	5 9
Double Truck Car Seats 36—Weight 11 75 tons. Average for the heaviest trip	13880	1432	9 25	335	1025	
Single Truck Car—no Trailer Seats 24—Weight 8 tons	8471	921	9 30	310	1000	
Single Truck Car. Trailers operated 26% of the time Average for the entire day.	9400	1110	8 42	254	1068	7 9
Single Truck Motor and Open Trailer Seats 63—Weight 10 5 tons. Average for the heaviest trip.	12500	1440	8 84	301	1218	

TABLE IV  
Comparison of weights carried by Single and Double Truck Cars.

	No. of Seats	Total crowded capacity	Weight empty	Percentage of weight on driving wheels.			Pounds weight per seat			Pounds weight per seat of total capacity		
				Car empty	Seats full	Car crowded	Car empty	Seats full	Car crowded	Car empty.	Seats full.	Car crowded.
Single Truck Motor Car.	28	80	16000	100	100	100	572	702	913	200	245	330
Single Truck Motor Car with open trailer.	63	140	21000	76	67	67	324	463	622	150	210	280
Single Truck Motor Car with closed trailer.	48	125	21000	76	72	71	438	508	756	168	218	298
Double Truck Car.	36	110	33500	70	70	70	653	792	1150	214	358	344

Note— Each passenger is estimated at 130 lbs.

weight on the small wheels, and with track in fairly good condition, no difficulty is encountered in keeping cars on the track.

### THE USE OF TRAILERS.

In the case of the two roads under discussion, the road operating single truck cars attaches trail cars to the motor car for two trips in the morning and two trips in the afternoon. For the entire year, trailers were operated on 26 per cent of the trips. Allusion has already been made to the use of trailers. The advantage of the trailer on this particular road arises from the fact that the load peaks are unusually sharp. The use of the trailer increases the capacity of each unit during the heavy hours of morning and evening travel and during rush travel due to baseball games and races. On this particular road the motormen and conductors are paid 10 cents per trip extra for all trips when a trailer is attached to the motor car. This expense largely offsets the value of this arrangement. There is no question but that the use of the trail car increases the number of accidents, for two reasons: first, because the trailer is another car; and second, because the opening between the motor and trail car is a dangerous one for a passenger boarding or alighting from the car. It is impossible to estimate the money value of this accident liability, because in the case of many accidents it is difficult to determine what proportion of the damage was due to the trailers. Trailers must be switched at the ends of the roads and at the car sheds, and require men and horses for this purpose.

The use of trailers also entails other expenses, such as car heating, cleaning, repairing and car license, which should be charged against the trail car system. To counterbalance all these disadvantages, the only advantage which the trail car system possesses is its flexibility.

### THE SEATING ARRANGEMENTS, EXITS AND ENTRANCES.

As has already been stated, the cross seat is used almost so universally in connection with the double truck car, that it is fair to consider the economy and efficiency of cross seats and longitudinal seats in connection with the discussion. There is no doubt that the cross seat is preferable from the passenger's standpoint, and the reasons for this preference are not difficult to analyze. Passengers often travel in pairs, and the cross-seat gives a privacy to their conversation which is not possible with the longitudinal seat, the jerks due to the stopping and starting of the car are less disturbing to the passenger when he is seated facing the direction of motion, and the cross seat renders it easier to look out of the windows.

If two car bodies of the same size are taken and cross seats installed in one and longitudinal seats in the other, the car body equipped with the cross seats will have the narrower aisle. This induces two disadvantages in the cross seat car; one, that the crowded capacity of the car is less; and the other, that when the car is crowded, the time consumed in loading and unloading is increased. The latter difficulty will be the more serious, the shorter the haul and the greater the number of stops.

In the early days of the double truck car, it was customary to mount the body high enough so that the wheels would swing under it. This gave the car a very unsightly appearance and made it difficult of access. Three steps were necessary to reach the platform, and as these steps were steep, this form of car was particularly objectionable to ladies. By the use of the maximum traction truck with 33-in. wheels, however, it is possible to lower the floor to within 37 in. of the rail. By dropping the platform 8 in. below the floor of the car, it is possible to reach the platform by the use of a single step 14 in. above the rail. This renders the car as easy of access as the single truck car. In the opinion of the writer, the fact that the car floor may be made so low in double truck cars is the chief advantage of the maximum traction truck.

It has been attempted to facilitate the loading and unloading of large cars by providing exits and entrances other than the rear door. This practice, however, brings about what is perhaps a more serious disadvantage, as it gives the conductor more than one door to watch, renders it difficult for him to keep track of his fares, and increases the liability of his starting the car before a passenger is on or off.

### THE PREFERENCE OF PASSENGERS.

The preference of passengers to which allusion has already been made, is undoubtedly in favor of the double truck car. In cities where the entire street railroad system is controlled by one company, this point may not be considered of value, because passengers are obliged to ride in whatever conveyance the company chooses to furnish. However, the experience of roads which have changed their rolling stock from small, single truck cars to large, comfortable double truck cars, is that the travel has shown an immediate increase. Part of this increase has been drawn from parallel roads, but part has been a created traffic. As the accommodations increase, more people ride, and the regular patrons ride oftener. The street car ride, instead of being regarded as a necessary evil, comes to be looked upon as a pleasant part of the shopping expedition, the visit, or the picnic. How great this created traffic will be depends upon the class of patrons served by the road and upon the terminal facilities of the line. The extremes of society, the very rich and the very poor, are not good riders, and it is probable that a road serving either of these classes entirely would get very little return for additional accommodations. The greatest increase would come from those who are now the best patrons of the street railroads, the fairly well-to-do middle class.

In this paper the writer has not attempted to prove that either the single truck or the double truck car is the better type. He has merely attempted to discuss the subject to bring out the

strong points and the weak points of each type in such a way that the results may be applied to special and local conditions. Outside of the question of the economy of operation, there are few roads on which the use of attractive, easy-riding, double truck cars would not create a pleasure travel, especially in the summer season. In a general way it may be stated that the single truck car is more suitable for short hauls, dense traffic, many stops and low speed. On the other hand, the double truck car is more suitable for long hauls, high speed, few stops, and pleasure travel. In the existence of either extreme condition it would not be difficult to decide which car to use. It is in dealing with intermediate conditions that the manager must use his judgment.

The President: This paper is certainly a very interesting and able paper, dealing with a subject in which we are all interested. Now let us hear your views on the question.

Mr. McCormack (Brooklyn): Mr. McCulloch states in the paper that with the use of double truck cars it would be possible to lengthen out the headway. I wish to state that on our heavy lines we have had between three and four hundred double truck cars and in not a single instance have we been able to lengthen out the headway. The double truck cars increase the patronage to such an extent that we have had to shorten the headway. One thing more, and that is when it comes down to standing loads and moving crowds yesterday (Labor Day) I noticed on the cars seating 40 passengers going to Coney Island that the average was 65 on the register. With a double truck car, and a seating capacity of 60, it is nothing unusual to see 128 and 130 on the register, so you can see when you want to move large crowds, what the difference is with a double truck car compared with the single truck car. There are 178 double truck cars running in the service on one line, and you can imagine what the travel is on that line.

Mr. Dimmock (Council Bluffs): What is the headway?

Mr. McCormack: The headway on the Court street line, running from New York direct to Coney Island, is less than a minute. On the 3d avenue line it is three minutes, nearly all day, and part of the time 2 minutes. The headway from 65th street to Coney Island, where all the Coney Island cars converge, is about 20 seconds.

Mr. Sloan (Chicago): The double truck cars are certainly coming into practice and favor, and it seems to me the main question is the question of traction. I have had no experience with double truck cars, and I would like to know whether anyone who has had experience with them knows anything about using four motors instead of two to get the maximum traction. It is a subject we should know more about, because in the use of the double truck cars we are replacing the two motors with four.

Mr. Beggs (Milwaukee): I think Mr. McCulloch has so thoroughly presented the case that there is very little to be said upon it, particularly in behalf of the plaintiff. I do not think that the writer of the paper evinced any partiality as between a single and double truck car; but it is very evident in what direction the sympathies of the writer of the paper lie. In the city of Milwaukee we have for three years been experimenting particularly with the advantages and disadvantages of single and double truck cars. In 1896 there was put upon the system 20 double truck cars with maximum traction trucks. These cars were equipped with 18 double seats, seating 36 persons. A year ago, the early part of 1897, in view of our experience of a year in the use of the cars, we enlarged somewhat upon them, improved the trucks to some extent, we thought, by abandoning the maximum traction truck and so building the frame of the car as to in that way obviate what had been with us a very serious difficulty, namely, the forward wheels leaving the rail. We use 30-inch wheels to accomplish it. We increase the length of the car and seat 40 passengers by placing in double seats. During the present year we have benefited by our experience still further and increased the length of the car; that is the body, and enlarge the seating capacity, without increasing the length overall, which is 41 ft. over bumpers, and maintain virtually the same size of platform so far as the accommodations to passengers is concerned in crowds, by increasing the length of the body 1 ft., slightly moving the seats together and reducing

the amount of the bumper in front of the dash so that with our present car which we have, so far as our service is concerned, there is little left to be improved upon. We seat 44 passengers, having 22 double seats.

Of course, the question as to the use of the double truck car is determined by local conditions. Our double truck cars, for the climate of Milwaukee, are to a great extent a necessity. Because of the large open spaces and our short summer season, it is almost impracticable to maintain the duplicate equipment necessary for summer and winter service. I do not know anyone now in the service of the company who has not been converted to the use of the double truck car, and we have arrived at a standard. There are many reasons existing for the adoption of a standard car with us; the short summer season, the likelihood of chilling winds coming up and cold rains at any time in the warmest days of summer. We now have a car that suits us 12 months in the year. We have not had any difficulty with the matter of traction. We use a 33-in. wheel in our present equipment we are having built, and still maintain only a distance of 32 in. from the rail to the bottom of the sill, and that was one of the difficulties we had to overcome. We did that by giving considerable attention to the matter of construction and framing of the car to permit the 33-in. wheel to readily pass around our shortest curves. We are so thoroughly convinced as to the advantages of the double truck car that we are gradually permitting all our single truck cars to be worn out and scrapped as their life is brought to an end.

We have found that the use of the double truck cars has greatly increased the traffic; in other words, the people would wait for a double truck car on certain lines. We are compelled to place some of the single equipment on at times, but the people will wait on the streets where the two types of cars are run on the same lines, for the double truck car, for the reason that the riding is much more comfortable. Our double truck cars on our lines ride almost as smooth as a railroad sleeping car. That, of course, depends largely on the character of the track; but on a large portion of our lines, particularly on those lines where we are putting on the heavy equipment, we are having the connection between the rails cast-welded at the joints and we are doing away with the rocking and pitching motion of the car, and are enabled by the use of the double truck to make much higher speed, and that is the tendency of roads all over the country. We have to make higher speeds. We brought our average up within two years certainly a mile an hour. Our average speed now is somewhat in excess of 9 miles per hour. We would not be able to do that with a single truck car, because the oscillating motion and the liability of the pitching to displace the trolley wheel, whereas with the double truck cars we seldom have such an experience.

As to the matter of wear and tear, we believe the weight of evidence is in favor of the double truck car. While we have doubled the number of trucks and doubled the number of wheels to maintain the blow on the wheel at crossings and special work is so much easier that it does not wear the trucks nearly so much, and we find that our repairs of springs is possibly 75 per cent less on the double truck cars than on the single truck cars. We have been able on our lines, and I, of course, recognize the difference of conditions between Greater New York and our less populous cities, been able to increase our headway on most of the lines on which we have placed the double truck cars. In other words, we try to regulate the headway of the double truck cars to meet the general conditions during the larger portion of the day, and during the rush hours in the morning and evening, particularly in the evening, we either shorten the headway one-half or throw in intermediate cars, but still maintaining the regular headway of the regular equipment of the line; so that, so far as the city of Milwaukee is concerned, we are very strongly impressed with the very great advantages of the double truck car, many of which have been referred to indirectly in Mr. McCulloch's able presentation of the case, and we experience other advantages, which are governed by local conditions, and would not apply possibly in all cities, even of the same population.

A question was asked as to the four motor equipment. I might say that during the present year we have had 10 interurban cars constructed, running between Milwaukee and Waukesha



Beach, and the city of Waukesha, a distance of 26 miles or slightly in excess. These cars were carefully constructed after complete investigation, and the possession of all information we could get from electrical engineers, and based on this and our own experience and judgment, we have equipped them with four 1000 motors, geared to make 26 miles per hour, weighted with 40,000 lbs. Our double truck cars are possibly the heaviest in use anywhere in the United States. They weigh about 35,000 lbs. With these four motor equipments we have no trouble from lack of traction whatever, and we are beginning to believe that in the very near future it will be advantageous for us to equip all the double cars with four motors. We have some grades we are climbing with our double truck cars 33-in. wheels, running as high as 6 and 7 per cent. They do it with a little difficulty at certain times, certain conditions of rail and weather; but with our four motor equipments we have no difficulty whatever in climbing the grades and in getting, we believe, very superior service.

I think, Mr. Chairman, that the case of the plaintiff, which Mr. McCulloch has been pleased to term the double truck car, was so ably presented in his paper that it does not need any other advocate for it, and I should rather have denominated the double truck car the defendant, because there have been so many attacks made upon it. I can only say, so far as we are concerned in the city of Milwaukee, the double truck car has come to stay. The character of the population you are serving has much to do with the discrimination that is shown in the selection of a car to ride in. Some sections of the city do not pay much attention to it, and there are other sections that discriminate, and just as you cater to the pleasure and comfort of riders, we find the traffic increases on those lines. We have what we might call a mechanic district in our city, which uses our Third street line, which was equipped during the present year, and there is a marked increase on that line. I might say, as indicating the economy of the double truck, that on certain lines equipped two years ago with the double truck cars, we had previously maintained a headway of four and a half minutes, and by the use of the double truck car and the greater speed obtained together with the greater number of passengers accommodated, this line, running through the better portion of the city, we have been able to gradually lengthen out the headway to 6 minutes, without any complaint from our patrons. You can readily understand what that means in reduced equipment. Quite recently, within the last three months, by a further increase in the speed, on long time—our policy is to run long lines from one extreme of the city to the other for the comfort of passengers, and to avoid transfers—we have recently cut off another car and still maintained the same headway of 6 minutes by increasing the speed and making the trip in 90 minutes instead of 96 minutes. I might say that in the same way on the 3d street line, the line last equipped, we hope by the increased speed that we will be able to maintain, by the use of these double truck cars, over the oscillation single truck cars, we will be able to take off two of the 16 cars on the line and reduce the number to 14. This is one of the very great economies which we are realizing throughout the system by the use of these double truck cars. We are able to run at very high speeds on our lines from Milwaukee to Waukesha with these double truck cars, whereas with a single truck car it would be hazardous to run the cars at such speeds and they could not be kept on the track. The experience of the city of Milwaukee is strongly in favor of the double truck car. The latest improved truck permits us to use the 33-in. wheel, with the same facility as the 30-in. wheel, no greater height from the rail; and I think as soon as our necessities are known the manufacturers of trucks and cars will accommodate themselves to the new conditions and many obstacles will be overcome.

Mr. Bean (St. Joseph): I move that the report be received and spread upon the minutes and a vote of thanks extended to Mr. McCulloch for his able paper. Carried.

The secretary read a letter from Henry M. Watson, president of the Buffalo Railway Company, regretting his inability to be present at the meeting.

Mr. Kelly (Columbus): It has been suggested that all the members of the association who were present at the organization of the association in Boston in 1882, will rise.

W. Worth Bean, St. Joseph, Mich., George B. Kerper, Dayton, O., and Julius E. Rugg, Boston, were the only members present.

On motion of Mr. Kelly meeting adjourned to 9:30 Wednesday morning.

#### Wednesday Session.

President Lang called the meeting to order at 10:30 a. m. and announced the first paper of the session:

#### THE CARRYING OF U. S. MAIL MATTER ON INTER-URBAN AND STREET RAILWAYS.

By W. S. Dimmock, General Superintendent Omaha & Council Bluffs Railway & Bridge Company, Council Bluffs, Ia.

During the meeting of this honorable body at Niagara Falls last year, I had the honor of making a few remarks with a view of bringing about a discussion upon the subject of electric railways carrying the United States mails; and while the discussion was brief for the want of time, it was at least the means of getting the subject before you during this convention, and the only error the executive committee has made, is in not giving this paper to some one with a wider experience and more competent to lay the subject before you than I am; however, I consider it an honor for anyone to be called upon to address this convention and a duty which no one can afford to shirk so long as he is a member of the association; therefore, if in my attempt to lay a few brief statistics before you, I am able to bring forth some good discussions from the more experienced members, I feel the result will be a benefit to the association and the electric railway earnings in general.

There is probably nothing, or one might say, no one thing which is of more importance to the perfection of an absolutely satisfactory mail service than the saving of time; the electric canceling machine and the numerous contrivances of the manufacturers' craft employed in the handling of mail matter, all aim at the one end, economy of time. This is probably the most potent argument in favor of the electric car service for the transmittal of mail matter to and from depots, sub and suburban stations to the main post offices. As a general proposition the schedule time of the electric cars is absolutely to be depended upon; experience has demonstrated that the list of casualties likely to interfere with the progress of a car upon its designated route is smaller than that which often hinders the wagon service. In the case of the Omaha office, where I have had the best opportunity for observation, a noticeable gain is made in the service between Omaha and Council Bluffs, a distance of five miles, and Omaha and South Omaha, of the same distance; here the advantage is not confined to the saving of time but in the increased number of dispatches it is possible to make; the frequency and regularity of time on the electric car lines makes it possible to dispatch mail matter from one office to another, or from main office to sub-stations, to the best possible advantage, since the time can be regulated by the dispatching office at will in order to make certain outgoing trips of carriers, which might be impossible to reach if the regular running time of the regular mail trains must be considered, or the possibility of using the wagon service; before the use of the car service for this purpose, and when the railroad had to be depended on for the transmittal of mail between Omaha and Council Bluffs, Omaha business men frequently asserted that it was easier and more satisfactory to transact business by letter with Chicago than with Council Bluffs; almost as broad a statement might be made in regard to South Omaha. As an example of the difference made of the two modes of service, the Denver fast mail which reaches the Omaha office via the electric cars at 4:18 p. m., gets into the hands of the city distributors from 10 to 15 minutes sooner than when the wagons are depended on; this means the handling of an immense number of letters which reach the carriers in time to be taken out on their last afternoon trip, thereby being delivered to the patrons of that office on the afternoon of the same day, instead of the following morning and preventing a delay of something like seventeen hours. This great advantage of course relates to letter mail,

W. S. Dimmock was born in Sandusky, O., and received his early education in Cincinnati. In 1873 his business career began as a telegraph operator and station agent on the Ohio & Mississippi Railway. He filled various positions with the Mississippi Central, Wabash, Hannibal & St. Joe, Burlington, and Union Pacific Railways before his appointment as auditor and private secretary to the general manager of the Pacific Telegraph lines at Kansas City. This company was absorbed by the Postal Telegraph Company and Mr. Dimmock became manager at Omaha. In January, 1894, there was much dissatisfaction over the management of the interurban line operated by the Omaha & Council Bluffs Railway & Bridge Company, and he was chosen general superintendent. Mr. Dimmock believes in steam road practice on electric interurbans and was one of the first to advocate double trucks. He is largely responsible for the excellent service of his lines.



W. S. DIMMOCK.

responsible for the excellent service of his lines.

which is the first to be considered; the advantage is obvious if you happen to be in a position to observe the difference in time when the letters are conveyed by the cars as contrasted with that at which the wagons deliver the papers brought by the same train; in the interim between the two deliveries, the letters have been tossed on the table, back stamped and have found their way into the deft hands of the distributors and are being rapidly thrown to their ultimate destination.

One can only realize the vast importance of 10 or 15 minutes under certain conditions when he has missed a train by five minutes, or realize what can be accomplished in the same time after he has watched the distributing of a fast mail; what hours and days are to man, moments are to letters. A clerk in the Omaha office said to me recently: "The return to wagon service from the electric car system would be a plunge backward into the dark ages, which I trust we shall never experience." Mailing clerks and distributors alike, are unanimous and even enthusiastic in their commendation of the electric cars as a means of transit for mail matters so far as I am advised. Where sub-stations are supplied from a main office, the advantage of the cars admits of no question; the time saved in the actual transmission of the mail, to and from, is about one-half, so that where carrier service enters in as a means to be considered, the patrons of the outlying districts are given an immeasurably better and more satisfactory service. When this great system shall be utilized everywhere for the collection of mails over the cities, when the actual labor of "working" and routing of the mail shall be performed on the postal electric cars as they thread their way through the very heart of commerce, and a letter finds its way yet warm from the hands of the writer, to the depths of the mail pouch, then it will seem as if system could reach no higher pinnacle of development, unless, indeed, we learn to transmit mail sacks by the very lightnings of Jove.

Again I wish to make another comparison of time saved by using the electric railways to carry mails. Before the electric line between Omaha and Council Bluffs undertook to handle the mails between these cities, the mails left the main post office by wagon and were conveyed to the depot of the Union Pacific Railway, which is a distance of a mile in Omaha and one and eight-tenths miles in Council Bluffs, where they were then conveyed by train across the river, a distance of five miles. The Union Pacific at this time had about 11 trains in 24 hours, and part of these trains at night after business hours were over for the day, thereby making the mail service so very unsatisfactory that the public began to clamor for the mail to be carried by the electric railway from the time the road was open. We finally made a contract with the government to carry the mails between the two cities, and the public discovered at once that we were transporting these same mails from Council Bluffs to Omaha in the same time that it formerly took to deliver the mail by wagon from the Council Bluffs post office to the Council Bluffs depot; thus

saving the time consumed by the Union Pacific train between the cities, and time consumed by wagon from depot to post office in Omaha. In fact the mail was probably in the hands of its owners and in some cases answered long before it had crossed the river by the old route. Or a man could mail his letter in Council Bluffs, walk to Omaha and wait for its delivery under the old system, while the new route makes it possible for him to mail a letter when he goes to his office in the morning and get his answer by noon. No doubt an investigation would prove the same conditions exist in nearly every state in the Union at hundreds of places. This being true, we have shown the value of the service.

Now let us investigate the compensation. After it was discovered that the electric railways could handle the mails with so much satisfaction to all concerned, the managers of the railways thought they saw a great protection during strikes, etc., in the government, and were ready to carry the mails at most any price, but I believe experience has taught us, through some of the strikes in the east, that they did not find the protection anticipated. The electric railway managers were figuring on the basis of what the government had done for the steam roads during such troubles, and, while seemingly the comparison was a good one, it was erroneous from the fact that a mail car could be attached to an engine hauling 10 or 15 coaches of passengers and this one train would perhaps clear up the traffic for hours, while with the electric roads where the headway is anywhere from two to five minutes in large cities, where strikes are liable to occur, one train carrying the mail which the government would protect would make no more impression upon a congested travel than would one drop of water in the ocean, therefore it can be shown that the only benefit received by the companies for carrying the mails on street and interurban railways is the compensation allowed by the government for the same; hence the railways should work with an end in view to make this compensation enough to justify them in looking upon the carrying of mails as a profitable earning, and one which should receive their careful attention. It is true the government has made some effort to arrive at the cost of carrying the mails, but in doing so, if you will read the report of the committee to the postmaster-general, under date of June 25, 1896, which the government at Washington will furnish you upon request, and which contains a great deal of valuable information, you will see the report treats mostly upon finding out what expense the railways are put to in handling the mail, and not upon how much the value of the same is to the public. This report makes an allowance of 3 cents per mile for carrying pouches upon electric trains, while in the same report it is stated as follows: "The closed pouches upon the street cars should be compared with the star service which it replaces," and in the same breath the government states that "the star route service costs 4.94 cents per mile" while it recommends 3 cents per mile only for the electric service with its increased speed, more prompt and reliable handling; and, in fact, a superior service in every sense of the word. Following this statement, they also say, "It is gratifying to report the improved service will not materially increase the expenditures of the post office department." Why? Because we, the managers, have allowed them to dictate to us what we should have dictated to them, and they offer us for a better service less than they have paid for the same service by wagon, simply on the grounds that said service costs us but little, if anything; yet in figuring what it costs us, they do not take into consideration, as a rule, any expenses for damages, general expenses, and especially fixed charges. Where the regulation wagon service in various cities is costing the government 15.7 cents per mile travelled, it only offers the electric companies 16 cents per mile for a 16-ft car, and at the same time claims the service would be far superior and said car would take care of the natural increase for years to come. Does it not look unreasonable for it to dictate to the railway companies such terms when the service is so much superior to the wagon service? Why, in Council Bluffs it pays more for the wagon service to haul the mails to and from the depot, a distance of 1.8 miles, than it pays the steam road for hauling it from Council Bluffs to Omaha.



Why? Simply because the steam roads are post roads and compelled to carry the mails as the government dictates, while in the wagon route it is dealing with an individual and it is impossible for it to make a contract for any such unreasonable terms.

When the Omaha & Council Bluffs Railway & Bridge Company first closed the contract with the government for carrying mails between Omaha and Council Bluffs, the government allowed this company \$100 per month, and was satisfied it was getting value received, until other electric roads commenced to carry the mails more for protection than revenue, when the government immediately took advantage of the time and opportunity to make an investigation, of which the report of June, 1896, was the result, which reduced our compensation to \$50 for nearly the same service. Had the American Street Railway Association handled this matter in the past, as general managers and passengers agents of steam roads handle their affairs, the result of the government committee's investigation would have been different.

No doubt the companies spoken of in the committee's report to Postmaster-General Wilson under date of June 25, 1896, where they give information as to the cost of carrying mails and operating mail cars, have since then learned through experience that their estimates were entirely too low, although given in good faith at the time. The Chicago City Railway states that the revenue derived for running mail cars barely pays the expenses. Nearly every manager with whom I have communicated is dissatisfied with the remuneration. And here allow me to add that the running of mail cars in large cities like New York and Chicago is of vastly more importance to the government than it is willing to admit; while on the other hand to run these cars on regular trains is annoying to the passengers from the fact that where they are supposed to stop at sub-stations, connecting points, etc., the passengers are annoyed by the wait of a minute or so, and the result is the car is run as a special exclusively for mail, making it more costly to operate, and yet the government is basing the compensation upon the same basis as postal cars for steam roads; and we, as managers of electric roads, are allowing it to be done with all statistics before us to prove that the steam roads are not securing the remuneration they should. To prove this I respectfully refer you to some excellent articles in detail upon this particular subject in the "Railway Age," published at Chicago, December 31, 1897, and March 11, May 20, and May 27, 1898. It would be worth the time of any member of this association to procure and digest the articles referred to, as time would not permit of repeating them in full here. Congress has already appointed two commissions to investigate this subject known as the Gardner-Hubbard commission of 1877, and the Elmer commission of 1881. These commissions made elaborate reports advocating increased pay based upon speed and space. The recommendations were not acted upon for the reason that the railroad companies themselves, without extra pay, have been found to increase their speed and enlarge their space, and thus the government has actually received these advantages under the operation of the law as it stands. The steam roads had done more than their part, while the government took advantage of it and refused to act. The government has always been in the position of a beggar regarding facilities demanded of the steam roads for handling the mail.

In December, 1897, a great cry went up from Washington as to how the steam railways were swindling the government. This led to an investigation, and had I time I would like to quote the results of that investigation in detail. Suffice it to say, that this charge was ably answered by E. P. Ripley, president of the Santa Fe, and the charge denied by the Chicago "Times Herald," and the sum and substance was that the government was making thousands of dollars off the railways through the arrangements of only weighing mails every four years and obtaining car space unpaid for. For illustration, in these statements sent out from Washington, it was claimed that the amount paid by the government to the Erie road for the transportation of mails had been sufficient "to pay a dividend of 6 per cent per annum upon all the stock of the road." The stock of that road is \$150,000,000;

6 per cent per annum would be \$9,000,000; the total mail pay of the Erie road is less than \$500,000. Such statements as these place this matter in a false light, and, if after years of experience the steam roads are not in a position to obtain proper rates for the handling of mails, what will be the condition of affairs between the electric railways and the government if no effort whatever is made upon the part of the management of electric railways to look after this matter now? I realize that it is a hard matter for the government to make a flat rate to cover all roads and the local condition pertaining to each road; but as it has attempted to do this, I claim that it should have made the rate flat-tering enough to the electric railroads to make them become at least interested in the subject, and that 3 cents per mile for pouch service and 16 cents per mile for 16-ft. cars, which are fast becoming obsolete and replaced by cars from one-third to twice as large, is not enough. The government will naturally take advantage of the larger cars as it did where advancement compelled the steam roads to increase size of cars, speed, etc., but I doubt if it will increase the compensation for electric roads or take this question into consideration when figuring on cost of operation.

It is not for me to say how much we should receive, but for the members of the convention to take up the subject by discussion and work it out. This class of service is in its infancy; it will grow from year to year and after a while be worth thousands of dollars to us annually, and what we do today and what we neglect is laying the foundation for the government to work upon in the future. Then it behooves us to be on the alert and lay the foundation of the compensation so well that the government cannot tear it down when the time comes to declare the electric roads as post roads, etc.

For the present we are compelled to abide by the appropriation of congress and the rates made by it; but the question before us is how can matters be improved upon to benefit the electric railways in the future; very easily and a little patience of time. This convention represents as many millions of dollars of investment, I believe, as any other body of men coming together each year in this country. They are men whose power can be felt in every community. In unison there is strength, and if you, gentlemen, will take up this subject, discuss it thoroughly, and when you have reached an understanding, go home and lay the matter before the congressmen from your districts, convincing them of the good the electric railways can be to the public in carrying the mails, as well as themselves, to their very door promptness, frequency and dispatch, even though these homes may be in the rural districts surrounding our cities and towns, and it will only be a question of time until the influence of these efforts is felt at Washington, and something more substantial than glory and patriotism will be our reward for carrying the United States mails.

Mr. Sergeant (Boston): Mr. President, I should like to say a few words on the subject of this paper. I have been very much interested in this matter, and I heartily endorse all that the writer has given us. I have some data of our experience in Boston, which I thought might be of interest to the members. In 1895 our company in Boston was approached by the Post Office Department to see what could be done in the establishment of a trolley mail service, but as the writer of the paper has said, there was not sufficient money available for the purpose, except funds left over from the "wagon fund." We undertook to inaugurate the service, and take what revenue might be gotten by a transfer from this fund, as a test of the feasibility of the scheme. This was the first city in which the trolley mail cars were handled in the same manner as the steam railway mail cars, that is, with a messenger and clerks to assort the mails on the car. We began in 1895 with seven mail cars which we equipped, and for the information of the association, I will present a memorandum which I have concerning our trolley mail cars.

The trolley mail service was inaugurated May 1, 1895, and the night service June 3, 1895.

The number of trips made is shown in the table:

Year.	Week	Days.	Sundays.	Holidays.	Per Year.
1895 (at first).....	43		18	18	
1895 (later) .....	43		20	20	12,670
1896 .....	47		20	20	14,315
1897 .....	47		19	21	15,409
1898 .....	47		19	21	15,517

In 1895 the yearly mileage was 130,000 miles; in 1898 it will be upwards of 170,000 miles.

There were originally 12 stations, to which have been added one at Charlestown, January 1, 1897, and one at Roxbury Crossing February 1, this year, on which date also a pouch service was established between Somerville and West Somerville. Connections have always been made with the Boston & Albany and Providence depots, and Union Station; 16 men are constantly employed, eight conductors and eight motormen.

Out of about 45,000 trips run (to January 1, 1898), there were 360 failures or irregularities, or about 8-10 of 1 per cent, and that was almost wholly due to the snow and the consequent blockading of teams in the narrowest streets.

Seven cars handle 100,000 pieces of mail daily. The system is under the supervision of the New England superintendent of railway mail. In other cities the trolley and cable service is under control of the local postmaster. The general superintendent of railway mail of the United States, in his report for 1895, says: "In Boston, by reason of the fact that the street car lines are all under one management, we are able to move mail from one suburb to another, as, for instance, from North Cambridge and Cambridgeport to Brookline, by direct transit, the mail not being compelled to pass through the main office. There is probably no city in the country where the benefits of this service will be as great as in Boston, with its densely populated suburban districts, all of which have heretofore been more or less restricted in their mail accommodations by reason of their mail having to go through the city post office. By the present system the railway post offices centering at Boston, can 'pouch' to the street car lines all mails for suburban points reached by them; and the street car lines in turn can gather up all the mail from suburban points and pouch it direct to the departing trains at the various depots."

The first practical illustration of a street railway post office was in Boston. Other cities had street railway mail cars first, St. Louis and Brooklyn, where the mail was simply carried in bulk and delivered the same as if by teams, not being worked in transit; but Boston street railway cars were the first to be patterned after steam railway cars, with racks and all appliances for working the mails in transit, transferring, so to speak, so much working space, and clerks, from the main post office to the post office on wheels, thereby losing absolutely no time in handling matter, and enabling the business man to get his mail early in the morning rather than late in the afternoon, with nearly a whole day saved for him. One car is equipped with an electric cancelling machine, with a capacity of 2,000 cancellations an hour.

Let us follow a car to North Cambridge, and touching Park Square, Cambridgeport and Cambridge post offices en route. Take the first trip in the morning, where the postal clerk receives from the general office all the accumulations of mail which arrive during the previous evening from all parts of the country. Upon arriving at Park Square station (the train from New York, with all mail from the South and New York State arrive at 5:30, this mail is delivered direct to the postal car, and the contents opened by the clerks and assorted for the carriers. Upon the arrival of the car at Cambridgeport, a 15-minute run, the mail for that station is about all ready for delivery to the carrier. This also applies to Cambridge and North Cambridge. Now this car receives all mails collected at the various stations and assorting it in the car, inward, for all outgoing trains, so that when it reaches stations en route for Boston, the mail is all ready for immediate dispatch.

Each car handles nearly five and a quarter million pieces of mail, or a total of 36,561,170 pieces for the seven cars in a single year.

I thought, Mr. President, that these facts might be of interest in showing that the mail service, as carried on here, is not merely carrying it from a station to the post office, which method

we investigated and decided could not be done to advantage, and which is virtually being done by pneumatic tube service here, but our method is practically a traveling post office, and each car is practically a branch of the general post office in Boston, which receives mail from the trains and assorting the mail and gives it to carriers, so that without question the average suburban mail here is two or three hours earlier in its delivery than it would be without this service.

What the writer of the paper says about the question of compensation I think is very true and important. I believe that something might be done by the association. We have never received a compensation which has more than paid our running expenses. I think that at any rate that should be fixed in an arbitrary manner, so much a car-mile for carrying the mail, is entirely unfair. It all depends, it seems to me, on the conditions; what service is rendered, what the character of the service is, whether combined with passenger service or whether it is done with independent cars, and what the local conditions of expenses are. For example, I know that there are some street railway lines whose gross receipts from passenger business are not equal to our operating expenses for conductors and motormen in Boston. I have no hesitation in saying that the average expenses here per car-mile for conductor and motorman run to about 7.5 cents. The hours for labor are 10 hours in 12, fixed by law, and the compensation is \$2.25 per day, and 30 cents an hour for trippers.

In some other cities the conditions are quite different; possibly they pay higher wages. On the other hand, some mail routes are one straight away suburban route where a rate of 10 cents a mile would be a good rate compared with one at 30 cents a mile where the conditions are like those in Boston.

I feel, Mr. President, that what our Congress may need is enlightenment, that they do not comprehend the fact that the street railway service is better than the steam railway service and is of a different character, and something which is such a public benefit that it would be a pity to have it stopped, and yet which is something we cannot afford to keep on unless we are properly remunerated. I am not without hope that something may be done through our Association by getting at the conditions of service through the secretary, in correspondence with different cities. That might be done in an official way to find out what the various conditions are under which different roads, which are members of our Association, are carrying mail, and what, if anything, they are willing to do in the shape of concerted effort to bring these facts before the members of Congress who have to do with these matters. Our Post Office Department is like all government departments, it only sees so many general things and not all the details that go to make up expenses and perfect service, but I believe it means to be fair, and if the true facts are put before it we shall probably be able to get a reasonable compensation for this service. I am obliged for the opportunity of saying a few words, and hope that some action may be taken by the Association that will benefit us.

Mr. Beggs (Milwaukee): I have listened to the paper which has been read with a great deal of interest, more particularly in view of the fact that the Milwaukee Company, at the present time, is going through the preliminary stages of establishing a mail service upon our lines, which has up to this date not been instituted, not even to the extent of carrying the pouch.

I may say for myself that I have not been enthusiastic over it, because of the fact that it did not seem to promise a profit; and I think, as has been truly said in the paper, that the amount of protection that the various roads expected when they were established as mail routes has not been of the advantage to them that they hoped for, and it was because of the advantage that many of these roads expected to derive because of carrying the mail, that induced them to fix an entirely inadequate rate of compensation to be paid by the government. The government took that rate of compensation fixed by the first few roads upon which mail was carried, and attempted to establish that as the basis of compensation to all roads whose services they require. I had presented to me by the post office officials at Milwaukee, the report of the second assistant postmaster-general, in which I found that there had been paid, not 16 cents per mile, but in many cities the rate paid per mile, as shown by the report for the year 1896, I think is about 11 cents per mile for postal car



service, or an amount considerably below that which it costs to operate a car over the line, and yet that car is supposed to be given the right of way at all times in order to make the service satisfactory; and in making inquiries about this matter, I found that the wagon service was costing nearly double what they expected to obtain a very much superior service for; and it seems to me that it is high time that this Association, in its capacity as such, should support a committee who would take this matter up with the government and establish some fair basis of remuneration, based, as Mr. Sergeant has suggested, upon the varying conditions. There are kinds of service that could be given in one city that might not be possible in another. In Milwaukee we could displace the wagon service because we controlled the entire street railway system, and the peculiar location of the various lines, reaching to all the suburbs and running directly through the city, east and west and north and south, they propose there to do away with much of the earlier collecting service by having districts in certain sections of the city and the carriers serving as collectors of mails, collecting the mail in certain districts and bringing it to one central point where the mail car passed and which would pick it up periodically throughout the day, thereby reducing the number of collectors required.

As to the question of carrying mail pouches on the regular cars of the system, I seriously question its advisability. It may possibly be necessary in some of the smaller cities. I am free to say for the Milwaukee Company that I do not favor carrying mail pouches on the platforms of our cars. The platforms, as we all know, are too valuable to use to carry a mail pouch at 3 cents a mile, and it would very greatly inconvenience the patrons on the line, many of whom insist on using the platforms whether you like it or not. It seems to me that if this Association would appoint a committee to take this matter up in behalf of the street railways of the country that committee could confer with the government officials and establish some fair basis of remuneration, not simply for the purpose of having street railways established as mail routes, but as in the case of steam railroads, a source of revenue and profit. I think now is the proper time to do it, because the street railway mail service is established in a comparatively small number of cities. I understand that in Cincinnati, as Mr. Sergeant has stated, the cost of running the mail cars is about what is received from the government, without any profit, or compensation for the wear and tear or anything of the kind. I think the suggestion made by Mr. Sergeant, that a committee of this Association should be appointed to take this up with the government for the purpose of having a fair rate of compensation, is an excellent idea, and it would be one of the most practical things that this Association has done for its members up to the present time.

Mr. Farson (Chicago): I have been impressed with this thoughtful and practical paper of our friend from Omaha. It is a question that will grow upon us from month to month, because, as has been stated, this service is just in its inception. When the street railway mail service is once started, there is no danger of going back to the old system, because the people will insist on the very best service obtainable. It is especially desirable for the large cities, because it gives a man an opportunity to send a letter in the morning and hear from it during the day, so that immediate action can be taken. It is an important matter to the street railway interests, for the reason that they should be reasonably and amply compensated for all the service rendered. The suggestion of the appointment of this committee is especially in point. Such committee could be appointed, and act under the direction of the Executive Committee, to collect from the different members of the Association such facts as may be necessary for them to have. We can by acting unitedly secure more forcible and intelligent action. I would, therefore, move that a committee of five be appointed by the chair to act under the directions of the Executive Committee and communicate with the different members of the Association, and get all the facts before them, keep the Association advised of their proceedings, and that they have authority to confer with the post office authorities.

Mr. Beggs seconded the motion.

Mr. Robert McCulloch (St. Louis): I once stated for the in-

formation of the Association that one of the roads in St. Louis made a contract with the government to carry the mail, and had two cars built especially for the purpose. The compensation was entirely inadequate for the service alone, not counting the investment in special cars. The company expected to derive a benefit by being able to designate its road as a U. S. mail road, and it had the inscription made on their cars, "U. S. Mail." As soon as the cars appeared on the streets, at the suggestion or interference of somebody, no one knows who, the government required the sign to be taken off of all the cars.

Mr. Dimmock (Council Bluffs): After an investigation and a conference with a number of government officials, I think the secret of our success will lie in acting together as a body, and in the fact that we are not post roads. They treat us now as they would a contract with an individual, and if the committee will keep that point in mind it is in our power to dictate to them the terms that we will make, instead of their dictating to us. That point is a critical one, and if we allow the present rates to continue, there will come a time when they will demand of us to carry the mail at the rates the same as they pay the steam roads, as mentioned in the paper, and that point should not be lost sight of. It is the most vital point in the whole subject.

Mr. Payne (Milwaukee): Recently I had an interview with some of the department officials, the postmaster-general and assistant postmaster-general in regard to this subject. I found these gentlemen much interested in this question, but the difficulty with them is the lack of funds. The trouble lies back of the department. It lies in the appropriation available for this purpose; and you will have no difficulty, I think, in getting a reasonable compensation from the departments if a sufficient appropriation is made by Congress. I think the trouble lies largely there, and I have no doubt that if the committee from this Association will take the matter up and present it properly to the committee on appropriations having in charge the post office appropriation that you will secure a very large increase. I have found the department officials willing to investigate the situation in the various cities and to act as far as the means at its command will allow; and I have no doubts that the methods proposed will be the proper ones to pursue. But, of course, it will require the committee selected, if they hope for success, to visit Washington and press the claims of the street railroads on the proper committees of Congress, before it takes up each individual case with the department. I am thoroughly in accord with the resolution, but the committee will find that it will have more to do than gather statistics and information. It will be necessary to go to Washington and present the case to the proper committee of the House of Representatives.

Mr. Farson's motion was then put to vote and carried; and the president announced that he would appoint the committee later.

#### EQUIPMENT AND MAINTENANCE OF ELECTRIC CARS.

By M. S. Hopkins, Electrician Columbus Street Railway Company, Columbus, O.

An ancient king of fable offered a rich reward to the courtier who could tell a story that would last forever. To him who undertook it and failed the price was his head. Were this merry monarch living today he might gratify his wish by asking, "How shall I best manage my street railway?" and all his newspaper editors, councilmen, and other subjects would at once undertake the task, for it is a matter of common knowledge that everybody can manage a street railway much better than it has ever been managed.

The modern king of finance is daily asking this question of his hired subjects, and unless the answer is expressed in dividends the story is at an end and the head of the manager is the penalty of failure. To attempt to discuss all of the various elements entering into the composition of a successful street railway would be a continued story and not within the province of this paper.

What is the best electric equipment to purchase and how can it be made to render the best service at the least cost, is a question which daily confronts the street railway manager and one



M. S. HOPKINS.

M. S. Hopkins is a native of Henderson, Ky., where he received his education in the grammar and high schools, and entered the civil engineering department of that city. In 1890 he was employed in the shops of the Minot Electric & Machine Company, Columbus, O., but left that company to take up electric railway construction in Columbus for the Thomson-Houston Company. At its completion he became shop foreman for the Columbus Consolidated Street Railroad Company, and when it was reorganized he was made electrical engineer, which position he now holds. Mr. Hopkins was a charter member of the Engineers' Club, of Columbus, and was secretary for two years. He has been associate engineer in the construction of several electric lines in Ohio and is chief engineer of the Lancaster (O.) Traction Company.

on which he is constantly seeking advice. There can be no answer which is applicable to all street railways, and no especial merit is claimed for the views set forth other than that they are the result of experience and born of repeated failures and successes.

#### CAR EQUIPMENT.

No fixed rule can be laid down for the selection of equipment, as climatic conditions, character of traffic, frequency of headway, conditions of roadway, municipal regulations and grades are all elements which determine what the equipment may or should be.

#### CAR BODIES.

For years car builders have attempted to devise a car body which would be equally durable in both summer and winter, but judging from the character of equipment now in use on the majority of roads, such a car has not yet been produced. The combination car with movable parts is not satisfactory for winter use, is troublesome, noisy and cold, and is lacking in many of the essential features of the open car for summer service. The open cross seat car of the barge type with running boards on the side seems by far the most desirable type of car for summer service, affording the largest seating capacity and the best facilities for receiving and discharging passengers, which is a great advantage in city service. Considering all features, the box car with side seats, large windows, wide end door to the side of center, roomy platform and vestibules closed on one side, seems best adapted to the average conditions of winter service. While the vestibule types closed on one side is not so convenient for the handling of large crowds, yet the additional safety afforded on double track roads should receive full consideration even at the expense of convenience. In localities where winters are accompanied with snow fall and freezing weather, the vestibule affords protection to passengers, and motormen and conductors are able to render very much more efficient service.

The long car body seems to be growing in favor with the railway manager, due to the comparatively small increase in operation, in comparison to increased carrying capacity, and its allowing of the increase of headway or decrease in number of cars run, resulting in a large decrease in operating expense per passengers carried.

The purchaser of car bodies should have a clear conception of the details of car construction, and specifications should set forth clearly the essential features—minor details of interior finish and decoration being left to the manufacturer.

In the construction of box car bodies the trusses should be as deep as possible and great care taken to secure a perfectly rigid fastening at end of sill, as the slightest deflection throws an undue stress on joints and framing of car body.

Where side sills are plated on outside with steel plate, all season cracks should be thoroughly filled with a thick mixture of lead and oil, and the entire surface given a heavy coat of oil paint before the plate is put on. It is hardly necessary to say that all joints should be well leaded and protected from moisture.

A heavy steel roof rafter in one piece should be put in at every post, and a saving in maintenance will be made by having platform floors of oak or maple.

The trolley stand should be mounted on a trussed support, which will distribute the stress to the ends of car as much as possible.

Ash seems to be almost universally used in post and light framing of cars. This is probably due to the difficulty in securing the grade of oak necessary, the lighter weight of the ash and the greater ease with which it is worked. Yet in spite of these difficulties, oak is far preferable, being stronger and more elastic and will give a much longer life.

#### TRUCKS.

Under the average conditions, a 22-ft. closed car or an eight reversible seat open car body should be the limit for a single truck. Although there are single trucks which will carry a longer body fairly well, yet the increase in maintenance will in most cases warrant the use of double trucks. The local conditions should govern the type of double truck used, the bolster type in most cases being preferable for long cars on high speed, suburban service, while for city service, where heavy grades and quick starts demand maximum traction, and short curves make it necessary for the wheel to turn under the sill, the bicycle type must necessarily be used. This type of truck is no longer an experiment, and while it possibly requires more careful inspection and adjustment, very efficient service can be secured from trucks of this type.

Trucks should be made up of a small number of parts; cast and malleable pieces should be the lightest consistent with strength. Springs should be so arranged as to prevent oscillation, and give an easy riding car under all conditions from no load to full load, and when the style of truck is of such design as to prevent the use of an under truss, the spring base must be exceptionally long and end springs so arranged as to relieve stress on car sills.

The brake mechanism should be so designed that the stress will be equally distributed on all parts throughout its range of movement. Pins should be of ample size to provide for wear. The slider method of support for brake beam will be found more satisfactory than the loop support. The minimum amount of friction should exist between brake staff and shoe, and release springs must be as light as possible.

#### ELECTRICAL EQUIPMENT.

In the selection of electrical equipment the main point is to secure equipment of ample capacity and proper design for service required. In a railway motor, the mechanical and electrical features which influence its maintenance should receive very careful consideration. The bearings should be large and lubricated by oil from below and cup grease from above, and so designed that drip from bearings will fall outside of frame. The armature must be so constructed as to permit shaft being pushed out without disturbing the commutator and winding.

I am glad to note that the importance of light weight and slow peripheral speed of armature has been recognized in recent design of railway motors. The inertia or fly-wheel capacity of armature should be the smallest possible consistent with the work required. Engineers differ as to the best method of suspension. From a theoretical standpoint, the cradle or side bar suspension has the lead. The dead weight is largely removed from axle, thereby eliminating to some extent the hammer blow on rail joints, decreasing the wear on axle brasses and securing the better alignment of gears; yet, in practice, the nose suspension is still preferred by the writer, as the car starts more smoothly—the weight of motor on spring supports overcoming the jerk and quiver so common in other methods of support. The specifications for railway motors as drawn up by leading manufacturers of today, amount to practically nothing, and would suggest that the purchaser of motors in his specifications clearly define the rating heat limit and efficiency.

The series-parallel controller is in most respects a satisfactory device, the chief objection being the narrow range of speed on running notches. Specifications for resistance should provide that the last two points of resistance be of sufficient capacity



to allow of their continued use as running notches, especially where cars are operated in city service.

There are several types of magazine fuse boxes or cut-outs and single cut-outs using a special fuse, which possesses a number of points of merit. Without going into detail, it is the opinion of the writer that under average conditions the standard magnetic blow-out fuse box, using a link fuse, is preferable.

Each car should be equipped with a thoroughly reliable lightning arrester. Points to be noted in selecting this device are as follows: The kicking coil should always be installed; the air gap, which should be as small as possible; a positive and quick device for interrupting the current after discharge, and which will not be injured by discharge; a non-inductive resistance in the main circuit which will limit the flow of current and thereby prevent the opening of circuit breaker at the station when several arresters operate at the same time.

One of the most puzzling problems brought before the manager today is the amount which should be expended in the maintenance of old equipment before it should be replaced by new. To the average master mechanic this would seem a simple problem of making a careful estimate of the difference in cost of maintenance of the old and new equipment, due consideration being given interest on money invested in new equipments, and its increased efficiency. And yet, after the master mechanic has conclusively shown that by putting in new equipment a marked saving can be made in cost of operation, the manager has to consider the financial condition of the property, the advisability of increasing the investment, the possibility of doing so, and whether there are not other departments of the road where a greater saving can be made by increasing the investment. One should go slow in putting in new equipment, as new apparatus may at first seem to be void of the main defects inherent in old equipment, yet when put in operation, other defects occur which under the varying conditions may prove even more disastrous than the old.

#### MAINTENANCE OF EQUIPMENT.

The cost of maintaining equipment depends on various complex conditions, some of which are beyond control of the manager, and others for which he should be directly responsible. Heavy grades, numerous railway crossings, sharp curves, dirty and unpaved streets, imperfect and poorly constructed equipment, long and severe winters, all affect cost of maintenance unfavorably and are beyond control of the manager. But the character of men who operate the cars, the manner of operation, the way in which repairs are made, and the character of men engaged in repairs, and the material used, are the controllable elements and in most instances the chief features affecting cost of maintenance.

#### CARE OF EQUIPMENT IN CAR HOUSES.

Generally one of the following three methods are used for daily inspection of car equipment, namely: Inspection of cars each trip; inspection of equipment at night by motor inspectors; inspection of equipment during the day by motor inspectors and repair men.

In regard to the first case, that of the trip inspection, I would say that in the present degree of perfection attained by manufacturers of railway equipment, trip inspection should not be necessary, and excepting on interurban lines operating at high speed over long runs, is of doubtful value. It is expensive, requiring the services of an inspector who is necessarily a man of some ability, for each line of cars. The period of time for making this inspection is necessarily very short and the entire time is taken up in mere inspection—little or no opportunity being afforded in which to make repairs.

In regard to night inspection, the experience of the writer has been such as to absolutely condemn such a method as expensive, slovenly and unsatisfactory. It is impossible to make a thorough inspection of cars at night, no matter how well lighted the car house may be, and the efficiency of the work done by the men is very far below that of the work during the day. Therefore, when local conditions will admit, inspection of cars during the day seems by far the most advantageous.

We will assume a car house station, from which 25 or more cars are operated. There is usually one general foreman in

charge of this station. His duties are chiefly those of the transportation department, but he should be a man thoroughly conversant with the usual trouble which may occur in the operation of the equipment, and know how to direct minor repairs. It would of course be better if he were able to personally superintend the actual work of repairs, but it is usually very difficult to find men who are good mechanics and likewise efficient in the transportation department.

For making inspection and running repairs such as should be made in car houses, it is a safe rule to have one man to seven cars. It is, however, important to have a man in all car stations, known as chief inspector of that division, who is thoroughly conversant with practical electrical and mechanical matters. This chief inspector should have under his care for inspection and repairs seven cars, and also have direction and supervision of the other two repair men who care for the remaining 18 cars.

It is important that the responsibility for the proper repair of cars be definitely located, as nothing is so demoralizing to the force of motor inspectors as to have a case of trouble arise and not be able to trace the responsibility at once to the proper source.

The duties of these men should be to make a daily inspection of every car assigned to them, starting first with their motors, examining the grease in the cups, the brushes, cleaning the motors, examining the connections, etc. They should remove the covers from their controllers about once in three days and oil the cans very lightly with vaseline or grease, remove any blisters which may have appeared on the contact points and carefully examine the adjustment of contact fingers. Too much emphasis cannot be given to the inspection of all brake rigging, and very thorough inspection should be made daily from the brake-handle to the brake-shoe, and the brakes tried by inspectors before car is placed in service. A broken brake-chain or worn-out shoe, a broken brake-clutch or a broken brake-pin are things that should never occur through neglect, and if an accident of this kind does occur, the cause should be immediately traced and the responsibility located. Economy in maintenance should never be exercised at the expense of absolute safety, and brake-chains, pins and shoes should be discarded long before the danger point is reached.

The general public forms its opinion of maintenance of equipment by the little things on the interior of the car, such as a screw loose in the back, a broken strip on the car floor, loose register pulley, broken hand-strap, broken glass, rattling glass, and hundreds of other little things which make the fittings of a car body. Repair men and inspectors should be so trained that in passing through the car on their inspection they should note any little thing of this kind at once, and the rule should be that they should stop and repair it at once, for if allowed to wait till some other time the repair is usually neglected entirely.

The actual repair work done by these inspectors should be all the work possible to be done without the use of machine tools, or which, if done by them, will not require the loss of car from service for a period of more than two hours.

If during this inspection the motor inspector discovers trouble which is beyond his ability to repair, he should fill out a repair slip and send the car with the slip at once to the repair shop, stating the nature of the required repairs, assuming that the repair shop is run as a separate department from that of the car barn. If the nature of the trouble is such as not to immediately incapacitate car for service, but which requires the service of the repair shop department, he should fill out the blank as above noted and send same to the foreman of repair shop, but this notice to the repair shop foreman should in no way release the motor inspector from the responsibility of the successful operation of the car. If the repair shop foreman is unable, owing to press of work, to take the car off the road at once, it is the duty of the motor inspector to continually watch the development of this trouble, and if at any time he thinks the trouble has so developed that the car is not safe for successful operation, he should leave it out of service and so notify the repair shop foreman. If the repair shop is still unable to receive car at the shop, he would then make a personal examination of car and assume responsibility for its further operation.

The question as to how often car equipment should be taken to the shops for a general inspection and overhauling, and to what tests the electric equipment should be subjected at the time of inspection, are subjects on which electrical engineers differ widely. Considering the average conditions and assuming that equipment is in good condition, it is the opinion of the writer that the taking of cars to shops once every six months should maintain the equipment in good condition and assure its efficient operation.

#### MOTOR BEARINGS.

Bearings should be run "close" at all times; the time of their renewal being determined by the effect of the wear on the gear and pinion, as the wear on these parts is largely affected by the wear of the bearings. After a series of tests covering quite a period of time, as to the wear of various materials used in motor bearings, the writer feels warranted in making the statement that either the best grade of babbitt or brass bearings should under the ordinary condition give a longer life than six months, and when a bronze bearing of the proper mixture is used and properly lubricated, a life of 12 months can safely be expected. The method of lubrication largely influences the life of brasses. The writer has, after long tests with various lubricants, discontinued the use of grease entirely on armature brasses, and in most cases on axle brasses, a good grade of engine oil, supplied through wicks, being more satisfactory and economical.

In order to reduce the maintenance of brasses to a minimum, the use of phosphor bronze is strongly recommended. Street railways operating 25 or more cars will find it economical to cast and machine their own brasses. This may be discouraging to the supply men, but it means money on the right side of the ledger when the expenses are footed up. A small brass furnace can be cheaply erected, and after suitable jigs which can be attached to any lathe have been provided for boring and turning, the cost of casting and boring is very little more than the cost of re-babbiting, especially where babbitted brasses are machined after boring, while the life of the bronze bearing is far in excess of that of any babbitt yet tried.

Rough and burnt commutators are too frequently the cause of expensive motor repairs and usually indicate imperfect motor design or inexcusable neglect. Well designed motors in good condition, even under the hardest service, provided, of course, the average work is within the rated capacity of the motor, should not require turning oftener than once in eight months. There is nothing that so well indicates to the practical man the conditions of the motor as the condition of the commutator. Whenever the commutator shows signs of burning or blackening, steps should be at once taken to prevent it. It is not advisable to try to prevent this by the continual sanding of commutator by motor inspectors, though the occasional cleaning up of the commutator with sand paper is necessary with all motors. The causes of trouble of this character are so numerous that mention is made of only a few of the more important.

The kind of brush used is an important factor. Brushes should be soft, close grained carbon, treated with a good lubricating compound—one which does not flow too freely from the heat from the motor and which will not burn and carbonize on commutator. The price of brush is not a material consideration, as a brush which is slightly superior to another will prove economical even at quite a large increase in first cost. The tension on the brushes is, as a rule, too light in railway motors. It is a common belief that heavy tension causes wear of commutator, but experience has shown that the actual wear of the commutator due to friction of the brush is very small, and that increased tension will in some cases materially decrease the sparking which causes the greatest wear. Improper alignment of brush-holders frequently causes sparking. In recent practice the use of side contact springs on brushes has been generally abandoned. On motors carrying heavy currents this spring is quite essential, as excessive heating of the brush is caused by limited contact in the holder.

Commutator insulation should be made of what is known as the built up mica segments of the very softest grade of amber mica. A hard, clear mica should never be used in a commutator, as this mica will not wear away as fast as the copper and there

is nothing so disastrous to the life of the commutator as high mica insulation.

In some motors it may be necessary to change the winding of armature and field coils in order to avoid the burning of the commutator. First, determine by actual experiment what change in winding is necessary, and then equip with the new winding every armature or field that comes in burned out. This will permit of change being made without any great expense, as the greatest part will be borne by the maintenance charge.

#### THE ELECTRICAL TESTING OF RAILWAY EQUIPMENT.

Elaborate systems for the periodical testing of insulation on railway equipment seem to be growing in favor with some electrical engineers, but the practical value of these elaborate tests is not fully demonstrated. Experience has shown that tests of this kind are very misleading and frequently cause the tearing down of equipment which under ordinary conditions, had no tests been made, would have continued in service for a long time.

Judging from my own experience, it is neither necessary nor advisable to periodically test the insulation on the equipment, but to make such tests only in cases where motors are not working properly. The proper training of motor inspectors as to the little points about railway equipment which clearly indicate trouble with motor, will in nearly all cases locate trouble due to weak insulation, so that it can be remedied before any serious damage has resulted to any other part of the equipment.

All armatures and field coils repaired should be carefully tested as to resistance and insulation to ground, and on all armatures having coils repaired, new commutator put on or commutator turned, resistance between commutator bars should be very carefully measured; using, preferably, a portable Wheatstone bridge testing set, capable of showing clearly a variation in resistance of 1-1000 of an ohm. This is one of the most important tests to be made, as more burn-outs of armatures are caused by the slight short circuiting of coils, due to solder, acid, or copper turnings bridging over the insulation under the leads than from any other cause, which can only be located by a test of this kind. Any mistake in connecting up the leads or a bad joint will at once be detected before any damage has been done. For testing insulation to ground, I consider a first-class magneto of 10,000 ohms resistance all that is necessary.

#### TRUCKS.

The design of trucks varying so widely, very little can be said in a paper of this kind as to detail of maintenance, other than to say that all joints should be kept perfectly tight, and where they do become loose, parts should be swedged out and refitted. All bolts should be fitted tight, and nuts secured by lock washers. Soft gray iron inset with plugs of soft steel has, in the opinion of the writer, never been equaled for brake-shoes. The material giving the greatest amount of friction against a chilled surface should always be used regardless of cost.

Much has been written of late on the subject of car wheels, their wear and alignment, and still street railway managers are careless about their wheels. Too much care cannot be given to the sizing and alignment of wheels, and the pressure with which they are forced in the axle. At least 50 per cent of the wheels removed from the cars throughout the country are caused by broken or sharp flanges, or a broken wheel. The use of sand largely influences the life of wheels. It could not be said that a sand box should in no instance be placed upon a car, but where it is possible to successfully operate without them, sand boxes should be discarded and other means used for sanding the track. It is in most cases far more economical to fit up a special car, capable of carrying a large amount of sand, and sand the track for say 100 ft. before each point where a stop is likely to be made, and on grades and in places where the track is exceptionally slippery to sand the rail for its entire length.

#### REPAINTING OF CARS.

The experience of the writer has clearly demonstrated that it is satisfactory to repaint cars without removing all of the old paint. Patent varnish removers, sealers, etc., are a snare and a delusion. The writer has found the following system of repainting cars to be quite satisfactory: First, remove all old paint by



softening it with a blow-pot just enough to allow it to be scraped off with a broad putty knife, not allowing flame from the blow-torch to at any time strike the bare wood. Sand surface off well with block and sand paper. Where any new work has been put in, it should be first primed with a coat of boiled oil and a little lead and allow it to stand for not less than four days. Dashes and all iron work should be thoroughly cleaned with strong alkali and primed with a coat of linseed oil put on boiling hot and allowed to thoroughly harden; giving one coat of oil and lead before color. If surface is rough, plaster with lead on this coat. Allow it to thoroughly harden and sand with block; then lay on two coats of flat lead, two coats of color, color varnish, stripe and ornament, finish with one coat of rubbing varnish and one coat of finishing varnish. The main object in the painting of cars should be to secure a hard, smooth surface which will hold out the varnish with the very smallest amount of material; the thinner this surface is the better. Care should always be taken where plaster is used, to make it as thin as possible, and lead coats, color and varnish should all be carefully tempered, so as to set alike, as most cases of cracking of paint are due to want of proper tempering of lead and color coats.

A car painted in this manner, should not require repainting for from six to seven years, if properly cleaned and varnished. Cars should come into the paint shop, even where the best grades of varnish are used, once every eight or ten months, and be thoroughly washed down with pumice and strong soap and given a coat of finishing varnish. The life of the varnish largely depends on the care given to cars in the cleaning department. Cars should be sponged off daily with clear water; any accumulation of dirt removed as far as possible by the use of a chamois skin and sponge—care being taken to rinse grit off before rubbing with sponge or chamois. Once every 30 days a car should be thoroughly washed down, using a good grade of soap. If impossible to remove dirt and stains from surface of cars with finer grades of soap, strong soap may be used, it being found that the injury to varnish resulting from the use of this soap once every 30 days will be more than offset by the saving in cleaning and touching up when taken into the paint shop for re-varnishing.

In the selection of designs for painting of cars, the plainest and neatest design should as a rule be selected. No lettering should be done on panels as this greatly increases the maintenance of paint shop department. The signs should in all cases be put upon sign boards, especially made for the purpose.

The inside of cars should be thoroughly cleaned and rubbed down with pumice stone every second time the car comes into the paint shop to be re-varnished. There are a number of so-called ear cleaners on the market which are rather a detriment than an advantage to the outside surface of cars, but which may be used to advantage on the interior of cars, especially around the sash. Special observation of the interior of the car will show that the varnish first commences to disappear around the sash—moisture from the windows gathering around the mould which holds window sash, first discoloring it and gradually working into the sash itself. A car-cleaner which is largely made up of oil and dryer if used about once a week on the window sash and moulding, will be found to be a great advantage. Three years ago four new cars were selected and a car cleaner used weekly on the windows of three of these cars, and today not a stain is to be seen on sash or mould, the cars having been re-varnished twice during that time.

After a number of trials of various floor paints and paints mixed especially for the purpose. The conclusion has been reached that there is nothing equal to pure white lead and linseed oil and suitable color for the floors of all cars. The majority of ear floors are stripped, and it has been found impossible to find any material hard enough to stand on the top of the strips of a car floor, while almost any material will stand the wear, but not the moisture, between the slats. It is therefore very evident that the best paint for this purpose would be one which would best preserve the wood in the floor of the car from the constant moisture to which it is subjected.

As to the ear roofs, the main object is to put as little material

as possible on the canvas of ear roofs, and that material should be elastic and yet withstand the action of the weather. Great care should be used in the tempering of paints for roofs. Avoid painting roof one time with one kind of paint and the next time with another, for this will invariably, in the long run, crack and require the renewal of canvas on the roof. In a number of cases it is customary to use slush or any old thing which happens to be in the paint shop for painting roofs of cars. This is a great mistake, for no paint is too good for the ear roof—the best white lead and oil giving the best results.

Unquestionably the trucks of the cars should be painted with a good grade of lead paint, as it prevents rust, decreases renewal of bolts and adds greatly to the general appearance of the car. A handsomely painted ear body, mounted on a dingy, rusty looking truck, has, to say the least, a half finished appearance.

Mr. Sloan (Chicago): Mr. President, the main points in the paper just read have been very thoroughly covered, I think, but there are some of the details with which I do not entirely agree. For instance, the gentleman states that he utterly condemns night inspection. With us night inspection works quite satisfactorily for several reasons; the main one being that we change our brushes every night. Every motor brush is changed each night. It works well on the commutators and results in very little burning down of the commutators. I have had commutators in for a year with not  $\frac{1}{8}$  in. wear, and I believe it is entirely due to the fact that we change the brushes every night. I think a car cannot be overhauled too often. With us it goes on constantly. When a motor comes in with the armature burnt out, the truck is run from under the car and another truck already prepared is run in to take its place. In that way we inspect our trucks frequently, and find it works satisfactorily.

Mr. Hawken (Camden, Me.): I am sorry the writer of the paper is not here, as I wish to ask him a question on an important point in regard to the series control of running motors. The electric people have always advised a certain point for hill climbing and efficiency of running the motor, and it has been stated that the series point with the fields in shunt has been the most efficient point, and one question that I wished to ask Mr. Hopkins was that I noticed that the rear motor on this point does about all the work, and the forward motor does very little. I know of one road in particular that uses this point very largely, and it has a great deal of trouble in burning out armatures, and I should like to know from some of the gentlemen here which is really the most efficient point in running the motors on series connections. I have made it a point for climbing hills to use the last notch on the series control with the motors connected in series-parallel. I find that the most efficient point to run them, and the armatures have a long life.

Mr. McCormack (Brooklyn): If there are no further remarks on this paper, I move that a vote of thanks be returned to Mr. Hopkins for presenting such an able paper. I learn from Mr. Kelly that Mr. Hopkins was unavoidably detained, as he had intended to be present and read his own paper; and I think a vote of thanks should be tendered to him.

The President: Gentlemen, W. Caryl Ely, the first vice-president of the Street Railway Association of the State of New York, has an invitation to extend to this Association, and he will now be given an opportunity to present it.

Mr. Ely (Niagara Falls): Mr. President, and gentlemen of the Association: The annual convention of the New York State Street Railway Association will be held at the Manhattan Beach Hotel next Tuesday and Wednesday; and in behalf of that Association, and upon the suggestion of G. Tracy Rogers, its president, I take pleasure in presenting to you the invitation of that Association to such of you who may be able to do so, to meet with that Association next week; and in that cool place, amid the singing of the murmuring waves, we may be able to get cooled off after the fatigues of this occasion.

Mr. Goff (Fall River): I move, Mr. President, that the thanks of the Association be extended to the New York Association, through Mr. Ely, for the very kind invitation to meet with it next week. Carried.

The President: The secretary has some communications in

regard to the place for holding the next convention

The secretary read letters from the Detroit Citizens' Street Railway Company, the Detroit Electric Railway Company and the Fort Wayne & Belle Isle Railway Company, Detroit, inviting the Association to meet in Detroit next year

Mr. Holmes (Kansas City): I would like to introduce Colonel Morse, who will extend an invitation to this convention to hold its next meeting in Kansas City.

Mr. Morse (Kansas City): Mr. Holmes this morning suggested advantages which Kansas City has as a place for holding the next convention, and we extend a most hearty invitation to the Association to meet there in 1899. We trust that the invitation will be favorably considered by the Association

The President: These invitations will be received and referred to the Committee on Nominations for consideration. I will now name that committee: W. Worth Bean, of Michigan, chairman; D. G. Hamilton, of Missouri; E. C. Foster, of Massachusetts; W. F. Kelly, of Ohio; J. R. Chapman, of Illinois; Henry C. Payne, of Wisconsin, and E. H. Davis, of Pennsylvania.

The secretary announced that special cars would be in front of the Hotel Brunswick at 2 p. m. to take the delegates to the wharf to board the steamer at 2:30 p. m. for Nantasket Beach.

Mr. Kelly moved to adjourn until 9:30 o'clock Thursday morning.

#### Thursday Session.

President Lang called the meeting to order at 10:30 a. m.

The President: The International Association of Factory Inspectors is now in session at the House of Representatives. It has been suggested that we send them an invitation to attend our sessions and to inspect the exhibits.

Mr. Robert McCulloch (St. Louis): Mr. President, I move that such an invitation be sent. Carried.

The President: We will now take up the first paper on this morning's program.

### TO WHAT EXTENT SHOULD STREET RAILWAYS ENGAGE IN THE AMUSEMENT BUSINESS?

By Walton H. Holmes, General Manager Metropolitan Street Railway Company, Kansas City, Mo.

When I consented to prepare a paper for this convention on the subject selected for me by the executive committee, namely, "To What Extent Should Street Railways Engage in the Amusement Business," I did so with great reluctance, knowing full well that the conditions to be met with in the numerous cities where street railways are an important public agency are so widely different as to present a different problem in almost every instance, and, except from a very broad view of the subject, to render comparisons altogether impossible. But in spite of these inherent difficulties on the subject, I feel that some general principles may be extracted from street railway experience which may be advantageously employed in correctly solving a problem which must arise in nearly every locality where street railways exist. I have not hesitated to ask for the experience of others, and I beg to acknowledge, in the outset, the many valuable responses which I have received from street railway managers for whose judgment I entertain the highest respect.

Street railways are peculiarly an urban agency. They were born of the wants and convenience of a city population and the development and growth of travel are so closely associated with the growth and prosperity of the municipality, that street railway managers can never be too zealous and active in every public enterprise which is designed and well calculated to stimulate municipal expansion and civic pride among its citizens. This is notably an age of progress in every line and in all directions. The ideal city of a few years ago is no longer considered adequate in its appointments for the welfare of its inhabitants. Every up-to-date city in the land has come to acknowledge that it owes a larger duty to those who live within its boundaries than merely to afford police and fire protection. The comfort and pleasure of its inhabitants must now also be considered and looked after,

Walton H. Holmes was born in Kansas City, July 6, 1861, his father being the pioneer street railway man of that city. Shortly after the death of his father in 1875 he became a clerk in the office and afterwards rose to the position of superintendent and vice president. He was instrumental in having the horse lines of the Grand Avenue Railway Company converted to cable in 1886, and became president of the company. At the consolidation of the cable roads in 1894 he was chosen president of the Kansas City Cable Railway Company. In the further consolidation with the Metropolitan Street Railway Company Mr. Holmes was made vice-president and general manager, which positions he still holds. Mr. Holmes' life has been devoted to the street railway business, but he is notably public spirited and no public enterprise has been undertaken in recent years to which he has not devoted considerable time and in



W. H. HOLMES.

which he was not a conspicuous figure.

and this tendency and demand of the age have crystallized and taken form in providing parks and squares for the comfort, pleasures and entertainment of the great body of the people and drives and boulevards for those who are more favored in the distribution of worldly goods. These public pleasure resorts are an important factor in the question under discussion. Wherever established, they are preferred by the people, who justly regard themselves as proprietors, and hence it is that many street railway companies which undertook to supply an obvious public want in this direction a few years ago, have found this particular occupation gone and only a small number of the important systems of the country any longer maintain these parks. The demand has regulated the supply.

But the street railways have a great and peculiar interest in these public parks. It is our mission, as a public agency, to render them as accessible and useful to the people as possible; and to this end it must be apparent that by a reasonable expenditure of money towards the amusement and entertainment of the people in their own resorts, street railway travel can be stimulated and the health and welfare of the community greatly promoted at the same time. Results are more easily obtained by encouraging a natural tendency of the kind referred to than by efforts to entirely create business through independent and artificial means. With rare exceptions, commissioners of these public parks look upon them as the inheritance of the people and regard it as a solemn duty to encourage the efforts of the street railways to render them as accessible and pleasant for the inhabitants as possible, and are only too glad to have their own endeavors in the same direction supplemented by the street railways.

Public parks are usually numerous and scattered in different localities and in this lies a great advantage to the street railway over the maintenance of a private resort of its own. In the one case travel becomes congested with the increased danger of accidents and maintenance of a surplus amount of idle equipment for a large portion of the year, while in the other, public patronage is more generally distributed where it naturally belongs and serves to keep better employed the standard equipment of the line without much additional expense or risk

With reference to parks and similar resorts, I therefore think it may fairly be deduced that street railways have generally found their maintenance on private account to be ill-advised and unprofitable except in a few localities where locations are such as to warrant more than the ordinary 5-cent fare, and that the best results are to be secured by intelligent aid of the public municipal authorities in their efforts to render their own resorts attractive, pleasant and entertaining to the great body of the people. The same thing is obviously true with reference to large buildings of a quasi public character intended to afford accommodations and facilities for conventions, entertainments and exhibitions on a large scale. In my judgment, such enterprises when judiciously conceived and undertaken, may well receive substantial encour-



agement from street railways to an extent which would warrant representation being accorded to them on the board of managers. I consider such representation important in the interest of the public as well as of the street railway, because both have an apparent and common interest in keeping the price of admission to such buildings down to a figure which will keep them always popular in fact as well as in name, and so a stimulant of travel on the street railroad.

Street railways have seldom undertaken to foster other than cut-of-door amusements and these are always attended by the risk of bad or unseasonable weather and the like, which frequently entails heavy loss. Cars must be accumulated in large numbers where such attractions are being presented in order to take the people away at the proper time, thus greatly increasing the cost of car service and some times necessarily retarding the tide of regular travel at other places with the attendant loss. Such enterprises frequently engross much valuable time of the chief managing officers which would otherwise be expended in other directions. These and kindred considerations which will readily occur to the experienced railway manager are very potent reasons why the companies should not themselves engage in the amusement business. Many of these things are impossible to estimate in dollars and cents, and so it is that street railways are every day coming to realize more and more forcibly that the business to be relied on for profits is that which follows the natural channels and can be handled in the usual and ordinary way.

I need hardly say that some of our large cities have reached a point where the ideas advanced in this paper have no practical application. With some of them, the problem is not how to create or stimulate travel, but rather how to best handle and take care of the patronage which is already at hand. Then again, there are many small cities which have not yet attained to that important rank which justifies the public authorities in undertaking to provide for the pleasure and amusement of the people at large. Street railways thus located have frequently found it profitable in a degree to supply this want on their own account, and to them the views here presented are likewise of little practical importance. I have considered more particularly that large class of cities which occupy the middle ground between these two extremes and where it has seemed to me there is opportunity for the profitable and practical application of sound principles of street railway management in the particular under consideration.

Where amusements are to be provided or encouraged at all, general experience shows that there is little or no difference of opinion as to the character of entertainment which ought to be furnished. The view entertained is well nigh universal that expenditures in this behalf should be moderate in amount. The best and most satisfactory results have generally been obtained from such attractions as novelties in the way of music like noted bands or other musical combinations, vaudeville, athletic sports, base ball where the city is large enough to have membership in an important league and to support a first class club, foot ball and other similar out-of-door entertainments.

In many of the southern and western cities visitors are few and business comparatively dull in the summer season, with much of the resident population sojourning at the seaside or in the mountains; and half-holidays with business houses generally closed are by no means infrequent. This condition means light travel on street railways unless some inducement outside of the ordinary is offered to those who have remained at home. Amusements and entertainments of the kind to which I have referred have been found to be well adapted to this purpose, and in many instances have proved to be undoubtedly profitable to the street railway.

It has occurred to me that perhaps I may be expected to say something of my personal experience extending over a period of many years, leaving my intelligent hearers to make such application of the same to their own conditions and environment as to them may seem advisable. During my service as a street railroad man, Kansas City, where I have always operated, has grown from a city of 30,000 to upwards of 200,000 inhabitants,

and consequently opportunities have been afforded me of viewing the business in a number of varying stages of its evolution.

In the early days we began in a modest way by providing a small natural park with music and attractions which were not very expensive. As the city grew and lines were extended, both urban and suburban, we established and maintained for a number of years two high class and well improved parks, one being located within the city boundaries where it could be reached for a fare of 5 cents, and the other on a suburban connecting line where the round trip fare was 15 cents in addition to the street car fare. At both of these parks flowers were extensively cultivated and displayed and amusements of many kinds were furnished, such as bathing beach, boating, dancing, vaudeville, music, light opera, balloon ascensions, and the like. No charge was ever made for any of these except for the use of bathing suits and boats and a small admission fee to the light opera. In the way of music, we have furnished some of the most famous hands which have visited this country and have frequently played so distinguished an artist and soloist as Signor Liborati and his band for weeks at a time. We have found the public taste in such matters capricious, demanding a frequent change of programme, and, as time has passed, a higher order of entertainment. On the whole our efforts have been appreciated and the patronage has been generous, but it is difficult to say whether the profits have been sufficient to justify the immense amount of energy exerted in this direction, and we have finally altogether abandoned the maintenance of any such places by the company. Two parks, one city and the other suburban, are still maintained by independent corporations, at which, outside of boating, bathing, etc., music has been the only attraction furnished the present season, except a summer opera for entrance to which a small admission was charged. We pay these park corporations a stipulated sum for furnishing our patrons with the free privileges of the parks. Meantime Kansas City has begun establishing its own public parks and as they become sufficiently improved to be generally used, it will be the policy of our company to encourage their use by the people in every reasonable and legitimate way.

We have always given liberal financial support and encouragement to the maintenance of a professional base ball club, and have always found the returns from this source satisfactory and I believe profitable.

Our company has given liberal financial aid and encouragement to the fall festivities which are of annual occurrence at Kansas City. They consist of a night parade by a local organization known as the "Priests of Pallas," representing, by a series of fantastic floats, scenes from history or mythology and a flower parade; and grotesque carnival parade in the day time on successive days, under the auspices of the "Kansas City Carnival Krewe." In these parades, many brass bands from the section of country tributary to Kansas City are employed to take part. The festivities extend over a period of several days and are the means of assembling a large concourse of strangers in Kansas City. They are universally regarded as bringing much trade and business to the city, and I am confident our company makes no investment in the way of amusement and entertainment to the public which brings better returns.

A noted military chieftain (General Hancock) spoke of the tariff question as a local issue, and such, in a large measure, I have found the subject assigned me for this paper; and I can only hope that something of what I have said may prove to be of local use to many of you.

The President: I will ask Mr. Wyman to open the discussion on this paper.

Mr. Wyman (New Orleans): Mr. President, at your request and by reason of my desire to accede to the same rather than because I think there can be very much said that will not to a certain extent traverse the grounds that Mr. Holmes has so admirably gone over in his paper, I wish to perhaps only re-emphasize some of the points that he has made, and I do so very willingly because I have had a considerable amount of experience on both sides of this question. I have always be-

lieved, and was very positive in my belief for many years, that a strict railroad man should stick very closely to his line of work, and that he had very little freedom or time for going into the amusement business or any other sort of business that was not intimately connected with the daily operation of his cars, the management of his power plant and that style of business and methods that pertain specially and particularly to the working of his road. Therefore I have always said:—Keep out of it; don't go into the establishment of parks and the engagement of actors and actresses, musicians and all that sort of thing; do not establish skating rinks; let someone else in the dramatic line, some impresario or manager do it. If you do it at all, lease it out to him, encourage him in some way, but do not manage it yourself or try to run it.

I have discovered, however, that as Mr. Holmes very truly says, local conditions affect this matter to a very large extent. I have also discovered the truth of the old adage that if you want a thing done well you have to do it yourself, and my experience with the persons who are engaged in the purveying of public amusement to the people is that they are not altogether the most reliable people in the world, and that it is a pretty good thing for you if you want to establish amusements upon that line, to take them under your own control and management.

I have also found in a great number of cities where I have had both official and friendly relations with the company and its representatives, that this promoting of amusement enterprises was a very good method of stimulating the business of the company. Now, Mr. Holmes very rightly says that it was a proper thing for the street railway companies to aid in the development of the municipal improvements like public parks, etc., and on that score there is a philanthropic and humanitarian work which we can do in this matter of amusements, especially during the summer seasons, for it is true that the universal custom in almost all cities is to close the theaters and places of amusement during the summer, and the wealthier classes of people very often to a large extent leave the city for some summer resort, and the other class, the class from which we derive the major portion of our income, are left without amusements and healthful entertainments and pleasant outing resorts other than places like a simple plain field, or in many instances a pleasant park, but they want something more. Therefore, on the humanitarian side of the question we can say that we are public benefactors by furnishing amusement for the people.

Further than this, it has been in some cities not the custom in hot weather for people to go out much in the afternoon and the evening, in the southern cities this is particularly true. With the sun beating down, fairly warm, but not so warm as you have it here in the north even, we find that our people do not go out in the day time, in the afternoon, and they were not accustomed, as a rule, to go out much in the evening, but to visit from door to door, neighbor to neighbor, sitting on the galleries, as we call them in our country, and getting cool and not getting out circulating about very much. Now we of the southern land have been trying to replace this practice with what we thought was better for them and incidentally for us, and we have provided, in quite a large number of the southern cities, places of amusement, with music and attractions of one sort and another, by which we have cultivated to quite an extent the outgoing of the people in the evening. That local condition may not prevail in many cities, but it exists with us; but we have found in the last two or three years, by having some of the resorts such as have been mentioned, open in the evening, with music and attractions, the people are commencing to go out and travel has been greatly increased. Therefore, upon that time, wherever a habit of insularity on the part of the people exists, these amusement resorts, if well conducted, clean and pure in all their surroundings, and in what is presented, will surely cultivate travel.

Now, so far as the congestion of travel, which Mr. Holmes speaks of on my particular line is concerned, I do not think that I fear that to a great extent. We are always willing to have a good deal of congestion in running a street railroad. It is always to be remembered that if a resort at the end of some particular line shall, for the time being, congest the travel upon that line, in a great many instances we use that line as a feeder to the others. In one city with which I am familiar, there is

one line, at the terminus of which is a resort of this character; but while the cars are leaving at a minute or half-minute and sometimes 20 seconds, headway upon that line, when it reaches the central part of the city the people immediately disperse to the other lines and the other lines get a large benefit therefrom. Fortunately the transfer system is not so extensively used as to preclude the other lines from getting some revenue. To that I think very often the congestion which we suggested as being possibly injurious is not so harmful as one might think. Further than that the constant keeping before the people of a suggestion of pleasure, or interest, or something to amuse, of something to relieve the tedium of business is a most beneficial thing.

One thing we must always remember, that is that street railroad riding is, after all, a habit. As a habit it is growing. We can all look back a few years when general riding was not so usual, when people walked a little more than they do now; when we sent out messages, not by telephone but by messenger, and he walked. Now all these different improvements that we are introducing in the way of finer cars, of higher speed, of better facilities and last of all, amusements, perhaps one of the most recent innovations, it means a constant tendency to increase the habit of street car riding; and I believe that anything that has that trend and tendency is certainly very beneficial.

As regards the details of these things, we might discuss them ad libitum, as how they should be conducted, etc., but that is mechanical, and will easily suggest itself to the mind of almost any manager. The main question is—does it pay? I think it does, and for the reasons I have suggested.

Vice-President Ely: Are there not some other members present who will discuss Mr. Holmes' paper? The convention would be very glad to hear from them.

Mr. Davis (Williamsport): I ask if there are any roads which keep their statistics concerning their amusement business separate and apart from their general business, showing exactly the amount of their travel which is due, as near as they can tell, to the amusement feature of their business. The experience in Pennsylvania among the small parks is that the profits derived from the amusement business is not in proportion to the risk of the money spent, and in quite a majority of places, the rule is, that it is almost impossible for the manager to separate the hot weather travel on amusement lines from the travel due to the entertainment or park itself.

Mr. Holmes (Kansas City): I will show that as far as Kansas City is concerned, where we have the out of town parks, we have kept careful records of the business, because we sell tickets to the park, and I would be glad to talk that over with anybody or send him information. I recently received a letter from Mr. Goodrich, of Minneapolis, who has a great deal of experience in the railroad business, and especially in the matter of parks. At Lake Harriet they have a nice pavilion, and they are relieved of the expense of maintaining the park entirely, and Mr. Goodrich is firmly of the opinion that it does not pay their company to employ a band of music or any other attraction for that park. I can easily understand why it would not, because in our northern cities, and Kansas City is almost one, as compared with New Orleans, our summer season only lasts probably two and a half months, and we are compelled to depend upon the weather for our business. If the nights are cool travel is very light.

Speaking for Kansas City, I am convinced that we had better let the city furnish the parks and we contribute towards the music and attractions in the park. The real difficulty in establishing public parks in Kansas City was due to the fact that the street railroad companies had been quite liberal in providing parks. The people expected the companies to do it, and it is hard to overcome that feeling. The people would say:—What is the use of our being taxed with a lot of parks and their maintenance when the street railroad people will do it? But these conditions are changed, and we now have a beautiful system of parks laid out for our city; and the company looks forward to great pleasure travel, contributing something to its support in the way of amusement.

Mr. Beggs (Milwaukee): I quite agree with the general trend of Mr. Holmes' paper. In our own experience, for some years we have in the public parks of the city band concerts of which the street railroad company paid the entire expense, the city



having no fund, as is the case in many cities. I thoroughly agree with that form of entertainment, and in behalf of our company we have a standing offer to duplicate any amount of money expended by the city, or raised by public spirited citizens for the purpose of giving music in the parks. Our experience, however, for two years, was that where we paid the entire expense, as we did, taking the daily receipts of the particular lines leading to the resorts in which these entertainments were provided at the sole expense of the company, that we never got back at the outside more than seventy-five cents for each dollar spent. While we seem to have an increase of gross receipts, which increased our gross receipts tax likewise, and made us seem to be doing an abnormal business, so far as dollars and cents left in our treasury went, we were the losers.

I am glad to hear this question discussed at this time, because we are having urged upon us now by individuals a scheme by which we would be called upon to put up a large amount of money for the parks by maintaining special amusements of this kind. From my experience and observation in various cities, I do not believe that it pays a street railway company to go into the amusement business. I think there is a great deal of misapprehension many times as to the manner in which this money is spent, by concentrating all the energies in this direction in one particular point of the city and giving amusements at that place. They fail to recognize that much of the money spent there might have been spent in other sections, and with better effect; not to give so much special prominence to one point. I think our experience this year where we have spent no money whatever on public entertainment has convinced us pretty thoroughly that that we are very greatly the winners by a refusal to contribute the entire amount necessary. I do believe in promoting the public parks of a city as maintained either by the municipality or by public spirited citizens, but I do seriously doubt whether any of these expensively maintained resorts pay the companies that promote them. I think it is because they have not carefully analyzed the total cost nor the effect upon the general system, and if the same enterprise had been expended in improving the facilities for travel, in making the cars more cheerful and comfortable and improving the roadbed, it would bring much larger returns than in spending it for a couple of hours of diversion in the afternoon or evening.

Mr. Harrington (Camden): We have a park and we have had considerable trouble due to the fact that people would come to the park and take the best seats, and would not ride on our cars. The park is very near the city and in order to guard against that we furnish the ticket on the car to each passenger desiring to go to the park, and charge 10 cents entrance fee to others. This method effectually shut out the objectionable element and by the use of the ticket we determined the number of people going to the park. We find that while our travel is increased, owing to the expense of operating the park, we received from the park income about 70 per cent of what the park costs to operate. The travel on the road, of course, is increased, and we can tell from the tickets just the amount. We think we are making some money, but whether we would make the installation and furnish the park if we had to do it over again is a question.

Mr. Farson (Chicago): The coming railroad manager who will be highly esteemed will be the man who not only gives his attention to reduced cost of operation, to the question of the very best electrical equipment, to the manner of the very best handling of his cars, to seeing that his track is kept in the very best condition; but he will also devote a large part of his thoughts to the question of stimulation of travel. As has been well stated, the matter of riding on the cars is a question of habit, largely, and in many cases today where roads are operated at a loss, or just about even, or a small profit, a little attention to this line would mean dividends to the stockholders. From the standpoint of a stockholder I am very much interested in this question. It seems to me that the practical operators of roads could take this question up and study it from all its points of view with great interest to people who own the stock. Conditions, of course, vary. In many small towns of 10,000 to 30,000 people, a little attention paid to the operation of a park, either directly by the company or by inducing some one to operate it for you,

would mean today a dividend to the stockholders. Street railways, like other institutions, need leaders, and not followers. At the head of these institutions should be broad minded, wide awake, up to date men who will study carefully the conditions in which they are situated and use their effort and their energy for the purpose of bringing money into the treasury of the company.

Mr. Clafin, Boston: We of the Norumbega Park, to which Park you gentlemen are invited, have had a very different experience from some of the gentlemen who have spoken. We have adopted a different system from most of the street railway parks in Massachusetts, and it has certainly been a great success for the park and the railway. We have adopted the practice of charging an admission fee for the park and discriminate in favor of our railway patrons. Our railway carries its patrons a distance of  $5\frac{1}{2}$  miles for 5 cents. We sell on our cars for 15 cents a round trip ticket, which includes admission to the park. We charge people going on foot or bicycle 10 cents admission. The result is that the railway patrons get admission for 5 cents and the other people pay 10 cents. That has a tendency to bring passengers to the railway company, and it has been a great success with us. The result has been that the park has maintained itself and costs the railway company nothing whatever for its maintenance. The revenue derived from the road has been net. Our line is a small one, but the patrons there have been worth nearly 600,000 fares to us, at 5 cents each, as the result of the park's entertainments. The admission to the park is through a registering turnstile, and we know where the patrons come from. This statement may be of interest as showing circumstances where a park can be made to maintain itself as an enterprise, and the railway not be put to any expense. The admission fee is small. We furnish theatrical entertainments, have a zoological garden, band concerts and other things, and manage to make the admission fee pay the entire expense, and also the interest on the money invested in the park, and the railway company gets its revenue net.

Mr. Lang, Toledo: I want to offer a few suggestions that may be of value. Our city has 140,000 inhabitants. We are conducting a place of amusement on the lake shore about  $5\frac{1}{2}$  miles from the center of the city. It was not established by our company, but is now controlled by it because we have purchased the road that built it. I had some misgivings about the value of the enterprise when it was started. We rectified some of the mistakes; one of them was that they started it on too large a scale, and did not charge any admission. At the outset a person who paid the street railway people 10 cents could get to the ground and obtain free admission and a free seat in the casino building where vaudeville and like comedy entertainments were given from 2 to 4 in the afternoon and again from 8 to 10 in the evening. The ride on the cars included a seat in any part of the house. At the same time they sold all kinds of soft drinks and had various amusements on the grounds. When it came into our possession we found it was losing money. It was said to have cost in the neighborhood of \$65,000 in land and buildings, and finding that it was running behind we imposed an admission fee of 5 cents, which makes it correspond to what the gentleman from Boston says, 15 cents for the round trip and admission to the grounds, and the patrons were registered by turnstiles, so that we knew at all times how many persons were going in. In addition to that, instead of giving free seats in the main part or body of the house we put in reserved seats, for which we made a charge of 10 cents. We found that was working so well that we went into the gallery and put in reserved seats in the first two rows. The people of our city and friends of ours said we were making a great mistake in imposing this admission fee of 5 cents and charging for reserved seats, but we tried it and it has been eminently successful. We have boxes that will seat four persons which sell for 25 cents. We found this last year that we came out a few hundred dollars ahead of the operating expenses, but we run the casino company as an entirely independent company, without any relation to the railroad company at all. It increased the earnings of the railroad companies about \$40,000 last year. This year the casino company will net about \$6,000, counting the fair depreciation upon the buildings, and the railroad company will increase its earnings



over \$50,000. Now I realize that conditions differ in different places. What would be a desirable thing in Boston or New York might not be so desirable in another place of smaller population and vice versa. But if any of you are further interested in this subject, I will be glad to give you any additional information I can, and hence will not take any more time of the convention in making further remarks.

Mr. Davis, Willamsport: The practice has been in Boston and in New England for the railroads operating parks to furnish amusements and rely upon their car fares alone to reimburse them for their working outlays. I would like to have the experience of the managers of these parks as to whether they think it is profitable, and how long such parks have been operated at a profit.

Mr. Wyman, New Orleans: I do not like to weary you in this matter and I am not from New England. In New Orleans we have the advantage of a long season. From the middle of April to September, and usually a supplementary season during the month of September. This year the park closes on the 18th. We charge nothing for admission to our grounds. We have a resort on Lake Pontchartrain about six miles from the city. We have a round trip car fare of 15 cents. The grounds are very extensive, large hotels on either side which we own, and a large platform, a pier, bathing houses, boat houses, and of course any one who uses the bathing houses or the boats has to pay extra, but the general thing is free. We provide a very fine band, our weekly pay roll for amusements running from \$2,000 to \$2,200. The park has been operated as expensively as that for the last two or three years. We did not begin in such an expensive manner. We went at it in a small way, but finding it profitable, we have increased every year. We have chutes and merry-go-rounds and all sorts of things of that kind. We keep an accurate record of our operating expenses and our receipts, keeping the road entirely separate from any other road, keeping an accurate record of all the cost of expenses at the beach, and we find that our proportion of receipts to expenses varies little from the ordinary electric road. In winter we do not do so well. Our operating expenses run from 70 to 90 per cent of the gross receipts, and that includes the winter time when the people do not go out, but we run the road all winter. Of course we have some rentals there, and we find we are amply repaid by the travel. We charge nothing for entrance to the park to any one who may come in a carriage—it is at the end of the Shell Road—and we allow everyone free and absolute access, and it is our impression that the fact that it is there helps us. We carry a man 12 miles for 15 cents and give him a good show in the matter of good music and other things, as good as he can get anywhere else for half a dollar, and the people are inclined to come.

Mr. Holmes, Kansas City: I notice a gentleman in the audience who was with our road in Kansas City for four years and laid out the first park for our company. He has had a good deal of experience with parks since that time, and we ought to hear from him. I refer to Mr. Chapman.

Mr. Chapman, Chicago: I am somewhat rusty now on the amusement business, but I can give a little experience at Grand Rapids, Mich., where the lines were converted from cable and horse cars to electric, and a very pretty park was constructed at the lake, where the average haul was four miles from the center of the city. We commenced, as nearly as everybody else has done, in a small way. The first attractions were merry-go-rounds and things of that kind. It gradually became more and more expensive, better music, and unfortunately more and more bicycles, so that while the patronage largely increased the expenses increased in much greater proportion. Since I severed my connection with the Grand Rapids property they have found it advisable to build a small auditorium, and they help out their roads by charging admission to the reserved seat section of this auditorium, allowing the people to stand on the outside without extra charge. They furnish attractions costing them from \$400 to \$600 a week, and are making the amusement feature more successful than it ever was before, since the days of the introduction of the bicycle. Before that time it was very satisfactory.

Mr. Bean, St. Joseph: I see Mr. Fred W. Thompson, of Muskegon, Mich., in the room, and I suggest that we hear from him.

Mr. Thompson, Muskegon: Mr. President, I came to listen, not to talk. It is true that we have a park at Muskegon, and also pavilions and theatrical attractions. The last three years we have conducted the attraction part of it on a little bit of a stage attached to the main building and have found it fairly profitable. This year we went to an expense of \$2,000 and built a properly constructed addition for theatrical entertainments with 584 reserved seats and the stage lighted by electricity. Up to this year we allowed everybody in the park without any restrictions. This year we allowed no one in the pavilion unless they purchased tickets on the cars. They may go into the old part of the building, which has flat bench seats with a capacity of 700, for the fare. The reserved seats cost 5 cents extra, and this year we have more than paid the cost of our theater from the reserved seats. The increased travel in the months when the weather was fine was \$1,000. A good park with good attractions in my opinion will be a paying venture for a street railway company.

Mr. Cahoon, Elmira: One point does not seem to have been touched upon by any of the speakers, and that is the increased liability to accidents. If we increase the travel by means of amusements or parks or entertainments, in carrying the greater number of people we are thereby inducing to go to these places, we certainly increase very materially the chances for accident; and it would seem to me that in the matter of expenses the question whether these parks pay or do not pay, the matter of damage suits and of the liability for damages that are incurred should be considered. I think that would open up a profitable field for discussion. This amusement question is becoming a very vital one, especially to the smaller roads. The road which I represent is of that class. We have a city of about 45,000 inhabitants and at the end of our line is situated a public park. We cannot control any of the privileges, but we can pay all the expenses for having amusements there, and unless we do that we do not get any travel there to speak of. The question of damages has come up on two occasions, and I think largely on account of the greater number of passengers carried incident to the amusement. I should like to hear something of the experience of others, and as to whether they reckon there is a profit in the amusement business, taking this question of damages into consideration.

Mr. Jones, Memphis: It seems to me the whole question is one of locality and conditions. Take the case cited by Mr. Wyman. He has a resort there which was there before the electric road was put in. I have often paid \$5 for a carriage to drive out there. It is a beautiful place. The more advantages he gives the people the better his patronage. Take a park in Boston. I do not see how a park could be profitable here, because the season is short unless you have a park which people will visit in the afternoon. If you expect people to go to a park in the afternoon at New Orleans and Memphis, it would be an absolute failure, because they do not go out at all except in the evening. We think we can do more in that line by having a park for the reason that our season lasts about eight months. Our people begin to go out in the evening early in April; and I have seen the temperature on Christmas Eve, 78 degrees with us. We think that sort of a place would be better than it would be up here. I think the question solves itself down to one of local conditions.

Mr. Heft, Meriden: I am glad to observe the gentlemen living up to the traditions of street railway men by being honest and coming here to tell us the truth. We are operating a park that we inherited when we bought the road. The people had spent about \$45,000 on the park. They had put up posts to tie their horses to, put launches and boats on the lake that everyone might take a ride, and they built a casino and a switch-back road. They provided baseball grounds, and all these things were free to every man who chose to enter there. I want to say to you that when the balance sheet was figured up the end of the year we found that our experience has been about the same as the gentlemen from Milwaukee, and I think the street railway men of today have run mad on this question of amusements, providing everything without any recompense whatever, and if we are going to make these parks pay, they must be run upon a business basis, the same as a gentleman over there on the left (Mr. Clafin) who charges an admission fee. We must not forget that when we add to the receipts we add to the operating expenses



of the road, and all these things must be figured out, or at the end of the year we shall be short. I am very glad to hear from the gentlemen on this question; and it seems that the only men who make any money, with the exception of Mr. Wyman, who lives in the sunny South, where everything comes to you free, are those who charge an admission to their parks.

The President: As there seems to be no further discussion on this question, we will now take up the report of the nominating committee. Mr. Bean, the chairman of the committee, will present the report.

Mr. Bean presented the report, which was as follows:

President, Charles S. Sergeant, second vice-president Boston Elevated Railway Company, Boston.

First Vice-President, Henry C. Moore, president Trenton Passenger Railway Company, Consolidated, Trenton, N. J.

Second Vice-President, Ernest Woodruff, president Atlanta Consolidated Street Railway Company, Atlanta, Ga.

Third Vice-President, Walton H. Holmes, general manager Metropolitan Street Railway Company, Kansas City, Mo.

Secretary and Treasurer, Thomas C. Pennington, treasurer Chicago City Railway Company, Chicago

Executive Committee (in addition to the president and vice-presidents):

Albion E. Lang, president Toledo Traction Company, Toledo.

George E. Yuille, second vice-president West Chicago Street Railroad Company, Chicago.

Frank Jones, president Memphis Street Railway Company, Memphis, Tenn.

John I. Beggs, general manager Milwaukee Electric Railway & Light Company, Milwaukee.

Ira A. McCormack, general superintendent Brooklyn Heights Railroad Company, Brooklyn, N. Y.

Place of next meeting, Chicago.

Respectfully submitted,

W. Worth Bean, Chairman.

E. C. Foster,

Ernest H. Davis,

Jas. R. Chapman,

H. C. Payne.

Mr. Shaw, Boston: I move that the report of the committee be accepted and that the secretary be authorized to cast the ballot of the Association for the gentlemen nominated. Carried.

The President: I appoint as tellers Mr. Chapman and Mr. Ely.

The tellers reported that the ballot had been cast unanimously for the gentlemen nominated, and the president declared them duly elected.

Mr. Farson, Chicago: May I not compliment the committee on this admirable report and the splendid selection of officers; and also upon its selection of Chicago for the next place of meeting. I may say on behalf of the street railway people of Chicago that we will do everything in our power to make the convention interesting, profitable and instructive. We will welcome you, gentlemen, with open arms. Applause.

The President: I will appoint as a committee provided for in the motion of yesterday, regarding the carrying of United States mail matter on street railways, the following gentlemen: John T. Burnett, Boston; Henry C. Payne, Milwaukee; Ira A. McCormack, New York; D. G. Hamilton, Chicago; W. S. Dimmock, Council Bluffs

The president read a letter from the Boston Elevated Railway Company inviting the delegates to visit any or all of the various power plants, shops, car houses, etc., of the company, and stated that special instructions had been issued to have particular attention shown to the visitors.

"The Chutes" on Huntington avenue extended its courtesies to the delegates. A letter was read from D. B. Dyer, of Augusta, Georgia, regretting his inability to be present at the convention; and a similar letter from Past President C. B. Holmes.

The President: I have been informed that T. Y. Dzushi, chief of finance and manager of stores of the Imperial Government Railways of Japan; and K. Sugahara, chief engineer of the Kobu, and of some street railroads soon to be built in Japan, are in the room, and have been attending this convention since

it opened; and I think that in some way we should express our pleasure in meeting them.

Mr. Ely, Niagara Falls: I move you, Mr. President, that the privileges of the floor be extended to these gentlemen and that they be invited to address the convention. Carried.

Mr. Sugahara: Mr. President and Gentlemen: It is a great privilege and honor to have the pleasure of meeting you on this memorable occasion, and to occupy a seat in this national convention of street railways in this great country. I desire to express my sincere gratitude for your hospitality extended to me as well as to my friend, Mr. Dzushi. Indeed, it is very difficult for me to express my feeling and sentiment to my heart's wish, because I am not accustomed to your language. However, I believe it will be some entertainment to you to know that an alien from the Land of the Rising Sun ventures to speak in broken English instead of her flowery and poetic language.

Japan is achieving a great deal in her material progress and is striving to accomplish in rapid succession what she learns from abroad. Your Commodore Perry opened our gate toward western civilization some 44 years ago, and today your generous discoveries and inventions lead us hand in hand to the march of material civilization, for which we are greatly indebted to your people and country. To tell you of my experiences regarding the construction of street railways in Japan, I wish to inform you that I was the first engineer of a private company which has built steam street railways for passenger traffic in Tokio in 1896 and since then. I am naturally devoted to the investigation of street railway construction, and you can hardly imagine how interesting and helpful it is to me to be present in this great convention.

The progress of our street railway system is very slow, and they are in a primitive stage as yet. For instance, they are only about 60 miles in length and most of them depend on horse power, except the Kioto and Nagoyo electric lines. Several electric railways, however, have been projected in different cities and towns throughout the country. We are firm in our belief that in the near future Japan will be found a network of electric street railways. Should I engage in Tokio street railways after returning home and apply the knowledge I have gained here, I shall be very much indebted to you all, and must pay cordial thanks. We have about 40,000 of "jinrikisha" and 90,000 of wagons drawn by men for the means of transportation in Tokio which greatly interferes with the progress of street railways. Notwithstanding these difficulties, Tokio horse car railway companies pay on the capital invested 30 per cent dividends annually, and our steam road company 13 per cent. We have no doubt that to build street railways in Tokio is one of the most promising enterprises. It is my great desire that our country shall progress in such a degree that when any of you shall come to Tokio you may go to any place in the city by street cars, not by jinrikisha, and that our country may be seen as one of the industrial countries of the world, not only as a country of beauty and curiosity such as Kioto and Nikko.

Thanking you again for your kind privilege given us, and hoping you all may enjoy the blessings of health, liberty and prosperity, I beg to conclude my remarks.

The President: Gentlemen, I am sure that I express the feelings of all the members of this association when I say that it is a great pleasure for us all to meet you. I take pleasure in presenting to you a badge that will admit you to all our sessions and every exhibit in the building, and I believe to every home in the city of Boston. I trust you will carry these with you with our best wishes. I also desire to present you with tickets to the banquet tonight, and we will be glad to have you join us at that time.

Mr. Dzushi: Gentlemen: It affords us great pleasure to meet you here. I desire to express our hearty thanks for your kind invitation.

Mr. Payne, Milwaukee: I desire on my own behalf and I have no doubt on behalf of all the members of the Association, to return to the members of the Massachusetts Street Railway Association and to members of the local committees, and all those who have interested themselves in entertaining us in the city, our sincere thanks for the magnificent manner in which they have done their work. I think it is not too much to say that the ar-

rangements for this convention have not been excelled in any place where we have met, certainly not where I have been in attendance upon the meeting. It is but proper that we should make known our feelings in that regard, and I offer a resolution that the secretary be instructed to tender to the persons the heart-felt thanks and appreciation of the members of this Association. Mr. Chapman seconded the motion, which was duly carried.

Mr. Payne, Milwaukee: One thing more. I do not know whether it is the proper time, but I think the members of the Association will desire to place upon record their appreciation of the manner in which the officers during the last year have performed their duties; and I therefore desire to move that the thanks of the Association be tendered to the retiring president and the other members of the executive committee of the Association.

Mr. Payne put the motion, which was unanimously carried.

President Lang: I thank you very much, gentlemen, for this expression. We have only done our duty, and we hope the result of our labors will be beneficial to all who attend our meetings, and all who may read the report of the meeting when published.

Mr. Ely, Niagara Falls: I move that a special vote of thanks be extended to the members of the ladies' reception committee who have been so untiring in their efforts to the entertainment of the visiting ladies, and who have expended so much time and pains in making their stay pleasant there. Carried.

The Secretary: I will announce the names of some new companies that have joined the Association since the opening of this meeting:

Warren, Brookfield & Spencer Street Railway Company, Warren, Mass.

Brockton, Bridgewater & Taunton Street Railway Company, Boston, Mass.

Providence & Taunton Street Railway Company, Taunton, Mass.

Milford, Holliston & Framingham Street Railway Company, Framingham, Mass.

South Chicago City Railway Company, Chicago, Ill.

St. Joseph Railway Heat, Light & Power Company, St. Joseph, Mo.

Fair Haven & Westville Street Railway Company, New Haven, Conn.

The President: We will now have the next paper:

#### INSPECTION AND TESTING OF MOTORS AND CAR EQUIPMENTS BY STREET RAILWAY COMPANIES.

By Frederick B. Perkins, Electrical Engineer Toledo Traction Company, Toledo, O.

In discussing this subject I have decided to speak of inspection and testing separately. The work of inspection is to be attended to principally in the car houses, with a small amount of attention while cars are in service. The testing is to be done in the repair shop. In no direction can a railway company save money, or increase dividends more rapidly, than by having its equipments thoroughly inspected by competent men, working systematically under intelligent direction.

After a car has been through the repair shop and is again placed in service, it is naturally supposed to be in first class condition. It comes then under the immediate supervision of one or more men, presumably the day and night foreman, whose duty it is to keep that car in good condition for so long a time with as little expense as is possible. These men should be thoroughly acquainted with every detail of that car. Instead of examining cars once in 30 or 60 days, a daily inspection is necessary.

I have thought it expedient for the purpose of setting forth my views on inspection, to describe the work as being carried on in a modern car house containing 50 equipments, and arranged for the easy handling of the cars, so that no extra help will be required for that purpose.

In dealing with the inspection of cars in this car house, we believe better results can be obtained by giving to each man



FREDERICK B. PERKINS.

Frederick B. Perkins was born in the Old Granite State June 27, 1865, and was educated in the public schools of Concord and in the New Hampshire Conference Seminary at Tilton. He was in the insurance business with his father until 1889, when he entered the shops of the Thomson-Houston Company, at Lynn. He was with this company for two years, doing considerable construction work for the West End Street Railway, of Boston, and for the Duquesne Traction Company, of Pittsburg. In February, 1891, he became general superintendent and electrical engineer of the Toledo Electric Street Railway Company. When it was consolidated with the Toledo Traction Company he was chosen electrical engineer, which position he still fills.

some particular branch of the work, rather than assigning to him a certain number of cars, and expecting him to do all the work required thereon. For instance, it is safe to assume that the controllers will be kept in better condition if the responsibility of a good repair be placed with one man only, than would be the case were this branch of the work made a part of the duties of several workmen in conjunction with all the other repairs found necessary. If this be true in regard to controllers, it will be found equally pertinent to all the other items of car inspection. There is also this advantage—the men will carry the tools and material for one particular kind of work only, whereas, if they had a multiplicity of duties to perform, it would necessitate their having a large assortment of tools and material, or wasting considerable time in going back and forth to the stock-room.

In this modern car house five men will be required. This estimate includes only the repair men proper and not the foreman of the car house, whose duties in connection with handling of motormen and conductors, sending out cars and similar work would require so much of his time, that he could only have a general knowledge of the work of inspection in the car house. Two of this number would be required to grease and inspect the motors, one to keep the controllers in repair, one to take care of the trolleys and to assist in the care of trucks and car bodies, one to have charge of the truck and car bodies.

The most vital parts of the equipments are the different parts of the motor, viz.: armatures, fields, bearings, brushes and brush-holders. The care of this part of the equipments should come under the head of greasing; and on the manner in which this part of the work is done depends, to a large extent, the frequency with which the cars will break down while in service; and also the amount of repair necessary to keep them in operation. Often times the most ignorant and cheapest men are given the place of greaser. On the contrary, it is a position where intelligence and thoroughness are imperative. In order that he may have sufficient time for thoroughness in detail, he should not be expected to ring alarms or attend to other matters of a miscellaneous nature; but should be held responsible for his own particular work.

The car should pass into the greaser's hands the first day after it is on the road and every second day thereafter. He should examine thoroughly the brushes, brush holders, gears, pinions, bearings and commutator. Of these parts, the care of the bearings and commutator is the most important and should therefore receive the greatest amount of attention. The manner of caring for the bearings is very simple. They must be well supplied with grease or oil and care must be taken that they are kept free from dust and grit and also that the grease feeds properly.

In the matter of the care of commutators, electricians seem divided in their opinion as to whether they should be sandpapered or not; personally, I am not in favor of it. Instead of temporarily fixing the commutator by sandpapering it, and thereby simply putting it in shape for one more day's work, I would get at the bottom of the trouble and either make a commutator (by some preparation of mica and copper which will not spark) or if the trouble lies deeper, remedy it by remodelling the entire motor,



This may seem to be a heroic measure but the end will justify the means.

I think, however, that usually the trouble is not in the commutator, nor with the motor, but in either the brushes or brush holder, or both; and it is probable that with proper adjustment, and with proper care and treatment we should find the trouble obviated, and sandpapering of commutators unnecessary. When speaking of the treatment of brushes, we refer to a treatment of oil or something similar.

The writer has personal knowledge of a large road where common brushes were used without any treatment or care except to replace as needed, and it seemed as if the man who used the most brushes was given the credit of taking the best care of his motor. The average life of brushes on this road and the above conditions with the commutator sanded every day, was six days. Subsequently, the sandpapering was stopped entirely, and the brushes were removed every six days and properly treated in oil. The life of brushes under this treatment was increased from six days to from 40 to 60 days. The trouble with commutators which before had been great, was reduced to a minimum, in fact almost entirely averted. It is possible that under some heavy conditions, the practice of sandpapering must be kept up but it must be accomplished in a different manner, and must be applied sparingly instead of indiscriminately.

Not later than every fourth day, every controller and switch comes under the notice of the man who has charge of these parts. The main point is to clean thoroughly, using a little vaseline on the contacts. The parts that are worn should be touched up with a file, or should be sandpapered and if badly worn, should be replaced, so that at least every fourth day the controllers will be sent out in first class condition. This man can also examine the car wiring, lamp fixtures, headlights and all similar parts.

The fourth man will have the care of the trolley poles and wheels. These should be carefully looked over each night and oiled if necessary. The man who attends to this part of the equipment will also have considerable time to devote to general inspection of the car bodies and trucks under the direction of the general inspector. Under the scrutiny of these two men should come all the details of a car body, such as grab-handles, window-catchers, curtain fixtures and similar parts. These should be carefully attended to each day, in so much as the reputation of the road will suffer in direct proportion as the attention to these small details is neglected. For the public is exceedingly exacting as regards the manner in which its comforts are catered to in these minor details; and the degree of excellence which characterizes this part of the work, will be largely instrumental in moulding and fashioning its opinion of the road and of its servants in management.

The matter of car cleaning will not be considered in this paper as it is not directly connected with the subject in hand.

After having touched upon the subject of the matter of inspection in the car house, we have to deal with outside inspection, that is, inspection on the road by the inspectors, motormen and conductors. It may be a good plan to have outside inspection, and it is often advantageous if not carried too far, but I do not believe it is desirable to have a large force. For this reason but very little of the time devoted to this line of inspection is really used in looking over the equipments, but must necessarily be consumed in getting from one car to another and in waiting for opportunities, and most of the trouble located by these inspectors is not of such a nature as to require immediate attention; and if it were, the inspector could not make the necessary repairs without taking the car to the car house.

Troubles of a serious nature, such as would require immediate attention and taking the car out of service, should be easily detected by the motorman or conductor, and reported at once to the proper official. It may not be entirely irrelevant to speak here of the relation of motormen and conductors to the inspection of cars. It has been proved that it is usually a waste of time, and very little has been accomplished by attempting to instruct motormen and conductors other than in the simplest ideas of electrical problems; for while on some roads there may be a number of old motormen who have a fair idea of electrical equipments, and

whom it would probably be safe to allow to locate existing trouble, it would be difficult to draw the line between the men competent in this direction and those wholly lacking in such knowledge. I know of nothing more distasteful to passengers unwillingly detained, than sitting in a car impatiently waiting while a motorman works over some part of the equipment in a vain endeavor to locate some trouble, the very nature of which he has not the faintest idea; and quite likely, at the same time, intertonging with the movement of several other cars.

Of course, contingencies might arise where men would be justified in attempting to locate trouble on their cars, but, as a rule, they should not be allowed to do so, as the practice is wrong. If they clearly understand the brake mechanism, the right manner in which to apply the power to the motors, how to use the cut-out switch in the controller, and have a clear conception of the general rules as promulgated by the company, this will be about as far as it is profitable to teach them.

But while we may not allow them to make repairs, or experiment with the equipment, we must educate them to the necessity of being able to immediately detect any unusual or threatened condition, and to at once report the same. In fact, they must be made to feel that it is their first duty to report everything that is working to the possible detriment of the company, and if we properly impress them with the importance of these details as outlined above, we shall have established a means of quickly locating trouble on the road; and that without the aid of special inspectors.

Next comes the matter of testing. The service which we will obtain from our equipments depends largely upon the manner in which the repairs are made. If the repair work be rushed through with the idea of going over as many cars as possible in a short space of time and with little or no regard for the thoroughness of the work, we must expect the necessity for repairs to increase to an alarming extent. If, on the other hand, we make our repairs with the idea that work thoroughly done will have a tendency to greatly decrease the liability to breakdowns while the cars are in service, and correspondingly reduce the amount of work to be done in the repair shops, we shall naturally consider the best means not only of doing the work, but of definitely determining its condition when finished.

To do this properly, we must resort to our testing (and we use the word "testing" in a broader sense than it usually signifies). For example, all material furnished, such as tape, mica, paper, etc., must be kept up to the standard, and to accomplish this, everything used should be carefully examined, or, under our classification, tested.

We must begin testing in the purchasing department. In the purchasing of supplies a great deal of trouble is often occasioned by changing the kind of material furnished. This is probably more noticeable in the case of small roads. Now, while there may be no great difference in the quality of goods furnished, or if any one of the many different brands were used exclusively, it would give satisfaction, yet the very fact that many different kinds are used has a tendency to produce a lack of carefulness in the details of the work which will almost invariably show in the general result. This will be noticeable in several ways. The workmen will take one of the following views of the matter; he will either think the management is careless in the matter, and, as a consequence, he will immediately commence to drop from the former high standard of work; or, he will think that there is nothing essential about the quality of the material used, and acquire the pernicious habit of utilizing anything which may happen to be handy.

When a workman once detects what seems to him to be a lack of thoroughness in any part of the work which has to do with his department, you have at that moment allowed to enter that department a spirit of carelessness, which will develop very rapidly; and, unless quickly suppressed, will in a short time produce disastrous results.

To attain to a condition of thoroughness in any line of work, may have called for the performance of a great deal of hard labor, the expenditure of much time and money, and the exercise of patience, skill and forethought, but how slight a relaxation of

vigilance on the part of some official trusted with the maintenance of the good condition acquired, can, in an incredibly short space of time, undo the good work accomplished; and cause a retrograde movement along the lines which had promised so favorably.

If, however, we have to allow only one kind of material in the repair shop, the question naturally arises as to how we can avoid being behind the times in the matter of different kinds of supplies; and also in the manner of their use. The answer is we must have an experimental room, and here must be tested samples of all supplies and material before being contracted for by the purchasing agent. I do not mean to say that this room must necessarily be entirely separate from the repair shop, as this would naturally require a large amount of machinery which we already possess, and would not care to duplicate. But this room must be considered by the employes as one in which they are not directly interested other than as they are required to work on some portion of that which is being tested; but the special testing and all the instruments for the same must be in a separate department; and if it is not possible to have a separate room, at least a part of the repair shop should be partitioned off for this work, as the amount of time wasted by the employes of the shop attracted from their regular duties by the testing of some part of equipment or material on the floor of the repair shop proper, would, if saved, more than compensate for the expense incurred in the creation and maintenance of such a room.

Having thus arranged this separate apartment for practically all testing purposes, and having impressed upon employes and workmen that herein will be settled all questions relating to work done and material used, we have accomplished one of the results aimed at, in that we have prepared ourselves to impress upon the men that any material placed in their hands for use in repairs, has previously been thoroughly tested; and this will, we think tend to raise the standard of work, as any results of poor workmanship on their part cannot then be laid to faulty material; we thus give them an incentive to conscientiously deal with established and known good material.

We are now able to take anything in the line of new material or any new ideas regarding the use of the same, or any electrical problems which may arise, and ascertain their value without interfering in any way with the regular work of the shop or of the employes.

It is neither necessary nor desirable that the workmen should know the merits or defects of whatever comes to the testing room. On the contrary, there are some of the employes who should be allowed to become familiar with a great deal of the work of this room. They will not only be more valuable for the knowledge thus obtained, but some of the work must of necessity be delegated to some other person than the electrical engineer. But at all times it must be made plain to them, that the room is distinctly a separate department having no connection with their ordinary work.

Having now provided for our testing department, and establishing its relation to the purchasing of supplies, and to the employes of the repair shop, what machines and instruments shall we need in its equipment?

A high and low reading direct current voltmeter; one having a double scale reading from 1 to 750, and from 1 to 15.

A direct current ammeter reading from 1 to 100.

A low reading ammeter would be very convenient many times but is not absolutely necessary.

A 50,000-ohm magneto bell, an alternating current voltmeter and some handy testing set will make an outfit of instruments with which we can do all the testing required.

If the alternating current is not within reach of the car house, we must procure a small dynamo and produce it ourselves. A very small machine, say 2 h. p., would be sufficient for all the needs of the testing department. If this machine is designed for about 100 volts, it would be most convenient for our use. With a few small transformers wound for 2,000 volts primary and for either 50 or 100 volts secondary, we are prepared to furnish any voltage within a range of from 5 volts to 10,000 volts.

The man who has this part of the work in charge can very

easily and cheaply arrange the details of installation of the wiring, etc. He can also make some resistance coils and many other pieces of apparatus which will greatly facilitate the quick testing of whatever may be sent to this department.

What shall we test? First, everything that goes into the repair shop. By doing this we shall be sure to keep all material up to the standard, which means an absolute guarantee against breakdowns caused by poor material. In this way we raise the standard of workmanship.

Second, all supplies which go to the foreman of the car houses. In connection with this matter we are of the opinion that in the testing room should be decided the manner of treating brushes, the length of time they should be used before being removed from the motor, the manner in which they should then be cared for, their final disposition, the proper attention to be given the trolley poles, the length of time they ought to remain in service, their condition when removed, and many other similar questions should not be left to work out their own solution, or dependent upon the feelings or judgment of the various employes and workmen, but should be definitely determined and decided in our testing department.

Many may be of the opinion that we are carrying system beyond necessary limits in thus definitely and positively arranging these details; but why should we allow several different men to use material in whatever manner they may individually see fit, to treat brushes as their fancy may dictate, to regulate the tension of trolley poles in accordance with their own feeling at the time rather than by any fixed standard, and various other matters which might be mentioned along these lines.

Third, all finished material such as armature coils, insulation for controllers, commutators and brush holders. We do not necessarily need to test every piece, but enough to satisfy ourselves that the general order of work is kept up to the standard.

Fourth, all armatures, fields, commutators and controllers as they are being made or repaired. One illustration will be sufficient to show how the testing may be carried on in this branch of work.

An armature is wound and ready to be connected to the commutator. With a small wire we connect all of the top leads together. With the bottom leads, each separate from the other. With a magneto or testing set we find the insulation of the complete armature is not right. First, we cut the small connecting wire on the top leads in several places, then by testing each of these parts we locate that portion of the armature which is bad; then, by removing the wire we will test each coil separately until we find the weak one. Next, by the use of our transformers we obtain three or four thousand volts which we apply to this one coil. If it stands the test, we may allow it to go through; and if not, it can be replaced. If we should find that the trouble extended to a large portion of the armature and indicated moisture in the coils, we may, by the use of this same transformer, obtain 25 or 30 volts; and by connecting the armature to the commutator with the exception of one end of one coil, then connecting one side of the 25-volt circuit to this end, and the other side of the circuit to the commutator bar left vacant, we may apply the current for the purpose of drying the armature. With this advantage, the heat will be generated in the core and the armature will dry from the inside instead of from the outside.

With similar tests on all finished parts sent out from our repair shop we have almost wholly removed the chances of failure in service, and have unquestionably added to the length of life which may reasonably be expected from our equipment.

By running a few wires from our testing room to that part of the shop where the cars are brought in for repairs, we are able to reach every part of the equipment in a quick and thorough manner, and it is probable that if a few tests are made on every car that comes to the shop, many troubles will be located before they have sufficiently developed to become serious. Hence, the time required to make tests will add nothing to the pay roll, while the benefits derived may be many. All cars should be brought to the repair shops thoroughly overhauled and inspected at least twice a year.

In determining what shall be the standard of the work in the



different branches of the shop, or finished material, and of cars in service, I do not believe there can be any fixed scale. But that, as we proceed with our testing and inspection, we shall gradually raise the standard of our work and it will only be a short time after adopting a thorough method of doing the work, that many of the daily perplexities will have been eliminated.

Mr. Chapman, Chicago: In view of the lateness of the hour, I move that this paper be accepted, with the thanks of the convention, and filed without discussion. Carried.

The President announced the trip to Plymouth, in the afternoon, and the annual dinner in the evening, after which the meeting adjourned.

### Friday Session.

The President called the meeting to order at 10:40 a. m., and announced that the first business would be the paper:

## COST OF ELECTRIC POWER FOR STREET RAILWAYS AT THE SWITCHBOARD, BOTH STEAM AND WATER POWER.

By R. W. Conant, Electrical Engineer Boston Elevated Railway Company, Boston, Mass.

It is my privilege to be able to communicate to you facts and figures bearing on the operation of 44 power stations located at the important street railway centers throughout the country. These figures cover for the most part the operation of the stations during the past year and were obtained through the kindness of members of this association as well as from experience on the roads in Boston. The aggregate capacity of power stations represented is 98,387 k. w. or 131,800 electrical h. p.

The total cost of operation for the production of power alone from these stations during the past year has been \$1,825,000 and if the power had been produced by all at as low a cost as it was in a number of the more economical stations the saving for the year would have amounted to \$443,300. It is the chief purpose of this paper to explain the "If," and to obtain some idea of its size.

In what has been published on this subject there are a great variety of opinions as to what should be included in the cost of power, and also as to whether the basis of comparison should be the car-mile or kilowatt-hour, this latter being due to the fact that up to within a few years there has been no reliable instrument, adopted by street railways for the measuring of their output. The car-mile basis is not a fixed standard. A car-mile up hill takes a great deal of power, while a car-mile down hill should take none and may be made a source of power.

In the analysis of costs of operation of power stations of various sizes and types, it is first necessary to adopt a standard for the unit of power. We have seen that the car-mile is unreliable. Recording wattmeters are at present constructed which will measure the output in k. w. h. They can be made to give results which are accurate within a very small per cent. This statement is abundantly verified by actual experience and is gradually becoming universally recognized. It is no doubt difficult for one who has been accustomed to figure cost of power production on a car-mile basis, to reconcile himself to the k. w. h. It should however be very easy for the steam engineer who is accustomed to deal with h. p. since the k. w. h. equals 1.34 electrical h. p. h.

It was evidently the idea of your executive committee in limiting the title of this paper to cost at the switchboard to abolish the car-mile and adopt the k. w. h. as the unit of power. And in comparing the costs from the various stations I shall use this unit. For the benefit of those who are accustomed to considering the costs per car-mile, it will be interesting to know that on many roads a car-mile takes just about 1 k. w. h. This is not true where grades and equipments are extremely heavy, in such cases two or three times this amount may be required.

In the costs of power, whether it is produced by steam or water, should be included the fixed charges as well as the cost of operation. Under fixed charges are: interest, depreciation, insurance and taxes on the capital invested in the land, buildings and machinery of the power station.

Roger W. Conant, electrical engineer of the Boston Elevated Railway, was born in Gloucester, Mass., November 26, 1869. He graduated at the Massachusetts Institute of Technology in 1891, having pursued the course in electrical engineering, and after graduation immediately engaged with



R. W. CONANT.

the West End Railway Company. He was the electrical engineer for this road during 1896 and 1897 and until the Boston Elevated assumed the management, since which time he has been with the new company, having charge of the department of electrical engineering.

Under operating expenses are fuel, labor, supplies, repairs, superintendence and general expenses.

In both the fixed charges and operating expenses the component items vary between widely different limits, and it becomes impossible to construct a law that will predict the cost under all circumstances.

On the other hand, for one who has had experience it is comparatively easy to predict what the power ought to cost under a given set of conditions. What it will cost must, of course, depend on management as well. In view of the variety of the circumstances governing these costs, I have deemed it advisable to establish, for purposes of comparison a standard plant whose conditions are fixed.

It is not my intention to imply that the performance or equipment of this station, which I shall employ as a standard, is ideal, or could not be bettered, but rather to assume equipment and performance based on facts obtained from stations in actual commercial operation during a long period of time.

As this station is described, its performance may seem to border on the ideal, and there is no question but that its performance is consequent on favorable circumstances, very nearly we may say test conditions. It is, however, in my opinion best to err on this side rather than on the other in establishing a station for comparison.

I shall assume the station to be located on the water front, the exact spot is unimportant, but since this association has chosen Boston as its meeting place we can consistently locate the station here as well. I have fixed the capacity at 3,600 k. w. The building erected on firm ground requiring but little piling or filling; building and chimney are of brick.

For equipment; three cross compound condensing engines, cylinders 28 in. and 56 in. by 5 ft. stroke; speed 80 r. p. m.; 150 lbs. steam pressure; three 1,200-k. w. direct-connected generators; six water tube safety boilers, 500-h. p. each. Economizers and exhaust feed water heaters, electrically driven feed pumps and coal handling apparatus. Such a station would cost to install as follows:

### CAPITAL INVESTMENT.

Building, foundations for engines and boilers, chimney,	
coal handling apparatus .....	\$120,000
Engines and condensers, heaters, separators and piping..	91,500
Feed pumps and economizers .....	18,000
Boilers and flue connections complete .....	61,000

Generators and switchboard complete .....	73,800
Land and docking facilities .....	17,000
Engineering and sundries .....	5,000

Total .....\$386,600  
 or about \$107 per k. w. capacity.

To obtain the figure for fixed charges, I assume interest at 6 per cent, insurance and taxes 3 per cent, depreciation 2 per cent, total 11 per cent, which makes an annual fixed charge of \$42,526.

I shall assume that this station produces 10,500,000 k. w. h. per annum; dividing the annual charge by this figure gives .4 cent per k. w. h. for the fixed charges. The depreciation is not intended to cover repairs which will be included under operating expenses. The 2 per cent assumed for depreciation is to establish a sinking fund against the time when the station will have to be entirely replaced by one of more modern and economical design. Time of replacement being taken at 50 years. A few years ago the time of replacement should have been assumed much shorter, owing to the imperfect design of power station apparatus then existing. But with the present advanced state of the art improvements cannot be expected to develop as rapidly

Before arriving at the cost to produce power from this station, it will be necessary to obtain the operating expenses.

In making comparisons between stations of different sizes and types the cost of labor is the most perplexing item

Some stations operate with two shifts, others three. Some have engineers paid at different rates and men which appear on the records of some are in a capacity which in others is absent or replaced by men of another class and rate of pay. I therefore give the following method of analysis of the labor item when gives satisfactory results when applied to station operation.

I can illustrate the method, and at the same time derive the operating expenses by applying it to our standard station. It is assumed that this station operates with three shifts of men, the duration of each shift being eight hours. This makes the shift hours per day 24 or 8,760 for the year. The same number of shift

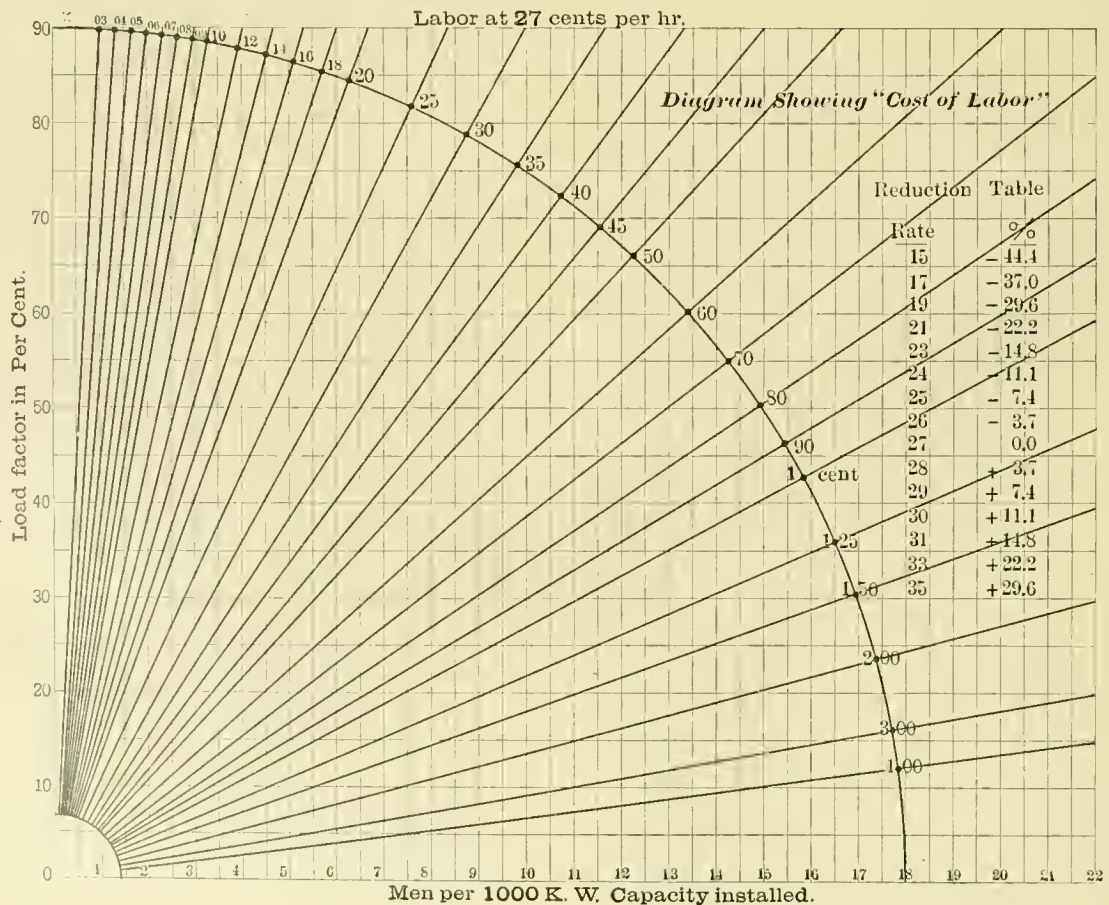
hours would of course be obtained by two shifts of 12 hours each, as is the case with some stations. For the three shift station, the first two probably would have the full complement of men, while the third would not, as the station might be shut down on that shift. But as there is considerable inspection, cleaning and overhauling, this shift requires almost as many men, though their rate of pay may be less. The highest rates of pay would be on the shift of heaviest load. The crew to operate the standard plant would be about as follows: Two engineers, one oiler, one helper, two firemen, one coal passer; total, seven men per shift.

The average rate of pay per man is taken at 27 cents per hour. This would be calculated from an actual station by dividing the total amount paid for wages, including chief engineer's salary, by the product of the number of men operating with the hours each has worked. The number of men per shift for this station being 7, I will divide this figure by 3.6 which is the figure expressing the capacity in 1,000 k. w. units. This division gives 1.94 as the number of men per shift per 1,000 k. w. capacity. This figure will vary with the type and size of station, as we shall see later. The fractional part of the man of course only appears in figuring.

Multiplying the 1.94 by the rate of pay, 27 cents, gives 52 cents as the cost of labor per hour per 1,000 k. w. capacity. This multiplied by 3.6, the number of 1,000 k. w. capacity, gives \$1.87 as the total cost of labor required to operate the station per hour.

It will further aid in the analysis of the labor item to introduce the load factor. As this term is sometimes employed in a different sense from that used in this paper, I shall define it to be that per cent which when multiplied by the capacity of the station in k. w. and by the shift hours for the period, gives the k. w. h. output for the time considered. I take as the load factor for this station 33.3 per cent, average, for the year. You may remember that in the consideration of the fixed charges I gave as the k. w. h. per year 10,500,000, which is 33.3 per cent of 3,600 k. w. multiplied by 8,760, the shift hours per annum.

It has been shown above that \$1.87 is the average cost of labor





to operate the station for one hour, and if we obtain the average k. w. during the hour, which is k. w. h. for that period, a simple division will give the figure for the cost of labor per k. w. h. The load factor gives the means of obtaining the k. w. h. and by multiplying 3.6 by 1,000 and 33.3 per cent gives 1,200 as the average k. w. for the hour, or k. w. h. for that period. Dividing \$1.87, cost of labor to operate the station per hour, by 1,200, gives .157 cents as the cost of labor per k. w. h. But 3.6, the figure representing the capacity, was used as a multiplier in obtaining both the cost of labor, \$1.87, and 1,200 k. w. h. It therefore disappears in the division and the expression for the cost of labor per k. w. h. is made independent of the capacity of the station to that extent. The rule then for obtaining the cost of labor per k. w. h. for any station is to multiply the rate of pay of the men by the number of men per 1,000 k. w. capacity, and divide by the product of the load factor times 1,000.

The use of this method will be illustrated if we compare the cost of labor per k. w. h. in the first two columns of Table I. It is .157 for the standard and .56 cents for station No. 1. It is rather difficult to account for this great increase until we notice that the men per 1,000 k. w. is 4.7 as against 1.94. The rate of pay and load factor also enter, as I shall show later.

I have constructed a diagram which gives the results of this expression for cost of labor for all usual rates of pay, load factors and men per 1,000 k. w. This diagram is based on a rate of 27 cents per hour, and there is also given a reduction table when gives the per cent to be added or subtracted for other rates than this. To illustrate its use, suppose we have a station whose equipment requires five men per shift per 1,000 k. w. capacity. During a month of high output it might operate at a 30 per cent load factor. On the diagram following 5 up to 30 gives cost of labor at .45 cents per k. w. h. In a lighter month the station might operate at a 15 per cent load factor. Following 5 up to 15 gives .9 cents, or twice as much for labor per k. w. h.

To further illustrate the use of this diagram let us consider that the equipment of our standard station is cut into so many units

that it required 3.7 men instead of 1.94. Price of labor and load factor being 27 cents and 33.3 per cent respectively; 3.7 followed on the diagram up to 33.3 per cent, gives .3 of a cent as against .157 cents for standard.

The cost of fuel is the next item to be considered in the operating expenses of the standard station. Considering coal as the fuel used its cost per k. w. h. depends on the price per ton and on the efficiency of the station which is best expressed in lbs. coal consumption per k. w. h. The coal for standard station I have assumed to be clear bituminous, costing \$3 per short ton delivered.

As to the efficiency, I am able to quote from tests in which I was personally engaged on a station of the same size and similar equipment.

The duration of the test was 45 hours, made under actual conditions of railroad service during the day, and at night the load was kept on the station by means of a water rheostat. I will say here, however, that the test on the steady night load did not show any great gain in efficiency, due to the fact that the day load of the station was steadied by feeding in with others. The average efficiency of transformation i. h. p. to e. h. p. at the switchboard was 90 per cent. The steam consumption of the engines was 14.5 lbs. per i. h. p. h. This record on a later test has been lowered. The boiler evaporation was 9.4 lbs. water per lb. of coal from actual conditions. The coal used was New River bituminous. The economy of the station, represented by the coal consumption in lbs. per k. w. h., was 2.3. I have assumed 2.2 for this figure for the standard station.

Reducing price per ton to price per lb. and multiplying by 2.2 gives .33 cent as the cost of coal per k. w. h. This appears in Table I., under cost of fuel. As an illustration of what the cost would have been had the engines required more steam, say 26.6 lbs. per i. h. p. h., as might be the case with a non-condensing engine. Referring to the fuel diagram and considering the electrical efficiency, boiler evaporation and price of coal to remain the same, 26.6 to 9.4 lbs. water per lb. of coal gives 3.8 lbs. coal per k. w. h. Following this line down to horizontal \$3 coal line and vertically

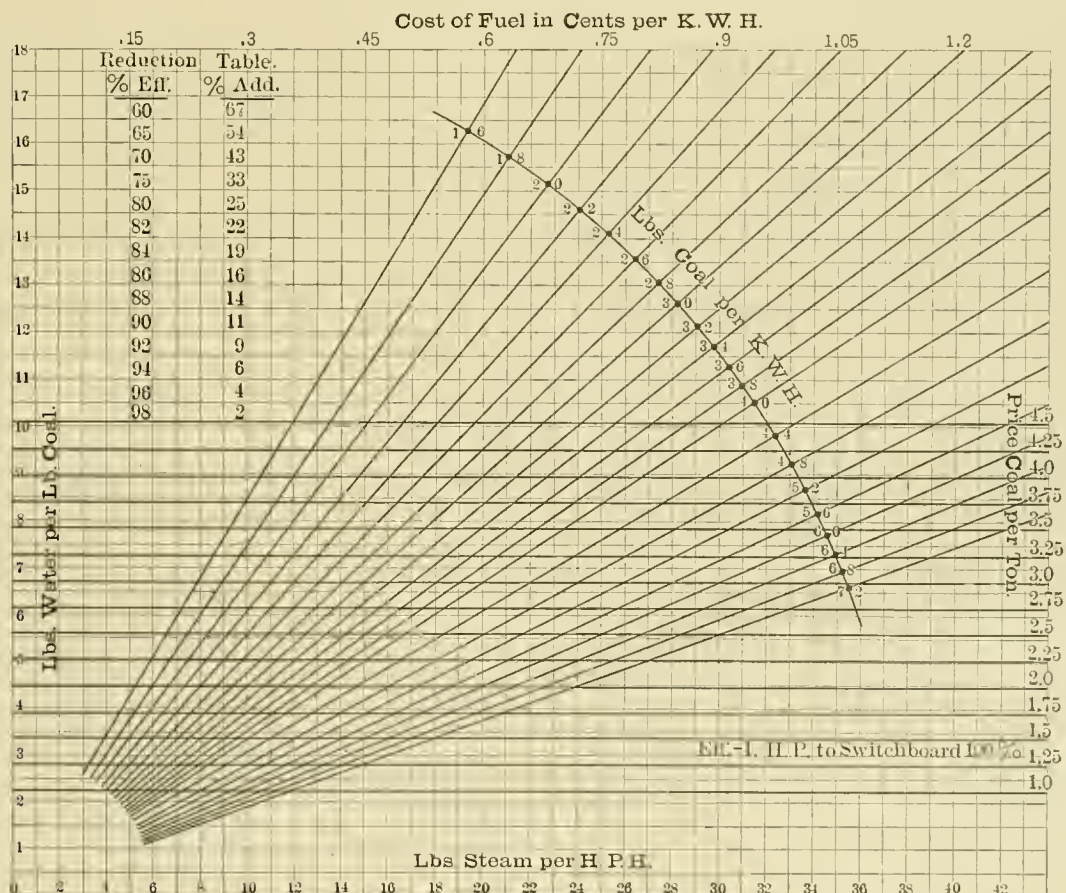






TABLE II. DATA ON "OPERATION OF POWER STATIONS."

No. of Sta.	5	10	11	12	13	14	15	16	17	18	19	23	25	26	28	29	30	31	32	33	34	35	37	40	42	43	44	45	47	48	50
Capacity 1000 K.W.	3.6	4	1.4	1.0	2.6	1.6	1.6	1.6	.8	4	3	.6	4	.8	1.4	1.9	1.7	.9	5.3	1.5	2	1.2	1.5	9.2	1.8	3.3	6	1	.75	6	
Units E.	3	2	5	3	4	4	10	8	2	2	6	3	10	7	4	5	5	3	5	4	4	1	3	6	3	5	6	4	4	2	
Units G.	3	2	8	7	4	4	16	8	4	3	6	3	19	12	8	5	5	3	30	12	4	1	11	6	6	10	12	7	4	2	
B. or D.C.	D.C.	D.C.	B.	B.	D.C.	B.	B.	B.	B.	B.	D.C.	B.	B.	B.	B.	B.	B.	B.	B.	B.	D.C.	D.C.	D.C.	B.	D.C.	B.	B.	B.	D.C.	D.C.	D.C.
S.C.T.	C.	S.	C.	S.	C.	S.C.	S.C.	C.	C.	C.	S.	C.	S.	S.	S.	C.	C.	C.	C.	C.	C.	C.	C.S.	C.	C.	C.	C.	C.	C.	C.	
N. or C.	C.	N	C.	N.	C.	N.C.	N.C.	C.	C.	N.	C.	C.	N.	N.	C.	C.	C.	C.	C.	C.	C.	C.	C.N.	C.	N.	C.	C.	C.	C.	C.	
Period-Days.	365	1	365	365	365	365	183	365	365	365	31	183	365	365	31	365	365	365	365	365	183	365	151	365	365	365	365	30	183	365	
Load Factor-%	33 1/2	24	23	23	42	19	41	33	24			16	33	19	23	27	23	32	31	16	57	37	11	36	45	15	30	28	20	35	
Taken from Miles			X						X			X																X	X		
Shifts.	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Duration.	8	12	12	12	12	12	12	8	12	12	12	12	12	12	12	10	10	10	12	12	12	12	12	12	8	12	8	10	12	10	
Shift-hours B760	8760	8760	8760	8760	4380	8760	8760	8760	8760	8760	744	4380	8760	8760	8760	744	7300	7300	8760	8760	4392	8760	3624	8760	8760	8760	8760	600	4380	7300	
Men per 1000 kw	194	7.5	3.7	3.7	3.0	187	6.3	3.7	3.7	3.7	3.0	3.3			5.0	3.2	3.0	4.5	3.5	5.0	5.0	2.1	80	2.7	5.0	3.7	3.3	3.0	8.0	6.7	
Rate of Pay	27	18	20	20	22	15	16	20	18	12	17	25			17	21	21	21	20	20	20	26	16	23	26	16	24	15	12	15	
Cts per kw.hr.	157	.32	.31	.16		.25	.23	.28			.51				.37	.25	.27	.29	.23	.62	.18	.15	.11	.17	.29	.39	.26	.16	.41	.29	
Lbs. per kw.hr.	2.2	6.7	4.3	6.5	5	6.5	5	5	5	5	6	5.6	6.8	7	3.9	3.3	3.3	4.4	3.5	4.3	5.3	4.7	7.3	3	5.7	3.7	3.5	4.7	5.1	3.3	
Price (\$)	per Ton.	3.00	2.00	2.24	2.93	1.44	2.10	3.30	1.43	.75	.60	3.44	1.05	1.15	1.63	2.80	3.00	2.84	3.00	3.08	1.00	1.24	1.75	1.60	1.60	2.70	1.60	1.90	2.12	2.75	
Kind A or B.	B.	.5A.	A.	B.	B.	B.	B.	B.	B.	B.	B.	B.	B.	B.	B.	B.	B.	B.	B.	B.	B.	B.	.5A.	A.	A.	.6B.	A.	A.	B.	.5A.	
Cts. per kw.hr.	.33	.75	.63	.47		.68	.83	.36			1.03	.29	.39	.57	.55	.49	.62	.52	.66	.27	.29	.63	.24	.45	.50	.28	.45	.54	.45		
Gen Ex. per kw.hr.	.093	.33	.11	.09		.14	.09	.06			.16				.08	.23	.15	.19	.09	.22	.12	.04	.12	.11	.18	.14	.15	.05	.21	.28	
Total Op. per kw.hr.	.58	1.5	1.4	1.05	.72	1.07	1.15	.70			.68	1.7	.56	1.2	1.02	1.03	.91	1.1	.84	1.5	.57	.48	1.85	.52	.92	1.03	.69	.66	1.16	1.02	
Fixed Charges.	.405		.44	.24			.24					1.																			

LABOR

FUEL

upwards from this point to cost of fuel in cents per k. w. h., we obtain .57 cent, were the efficiency of transformation 100 per cent; but since it is assumed to be but 90 per cent, 11 per cent has to be added to this cost, as shown in the reduction table. This gives the cost of coal per k. w. h. .63 cent as against .33 for the condensing engine.

There remains to be included in the operating expenses for this station, water, oil, small supplies, repairs, superintendence and general expense, which I have estimated at .093 cent per k. w. h. The total operating expense foots up to .58 cent, which added to the fixed charge of .4 cent makes the total cost of power from standard .98 cent or very nearly 1 cent per k. w. h.

Before comparing the costs from the various steam plants I will review briefly the circumstances governing the production of power by water.

The application of water power to street railways has the following points of advantage. In plants operated under any but very low heads the generating machinery may be installed at a less cost than for steam. Also the fuel expense disappears as well as a portion of the cost of repairs. A part of the labor expense will be saved inasmuch as no engineers, firemen or coal handlers are required.

The main disadvantage in the application of water power to street railway operation lies in the fact that generally railroad power stations are quite distant from water falls, and that it is very expensive to transmit the electrical energy to any considerable distance. The distance of transmission being hundreds of miles for the majority of street railways. That it may be made more profitable to employ water power when its location is nearby the road and the price of coal is high also, there can be no doubt.

The cost to produce power from water is often compared with the cost to produce from coal on the basis of continuous operation for 24 hours a day. For street railway service this method gives a false impression since it implies that the machinery is working at its full capacity for 8,760 hours per annum or 100 per cent load factor; as a matter of fact for street railroad service a load factor of 33 per cent is high.

To look at this from another point of view: the demand for power for street railways cannot be increased at will, as it may be in a manufacturing concern. In the latter if it is found advisable to run night and day at full capacity, instead of 16 hours, there is produced a correspondingly greater amount of the product, be it flour, steel rails or carbide of calcium, and this output is produced at a correspondingly decreased cost per unit.

For street railway service on the other hand there has to be installed sufficient generating machinery to take the peak of the load.

This is usually three times the average and is only of a few hours duration each day. If it were necessary or profitable to use this full capacity continuously for other industries, it would be possible to do this with very little increase of labor, no increase of fixed charges and the additional expense of producing the greater output would be merely the coal and a slight increase of supplies and repairs. This combination is the feature of the Niagara work.

When the expense of transmission shall have been decreased by the successful employment of higher voltage, it will then become a problem as to whether it will not be profitable to produce power from a steam plant located at a coal mine, coal costing in this case but 80 cents a ton. This would bring the cost of fuel down to .12 cent per k. w. h., as against .33 cent for standard plant. Further this expense would only continue for the comparatively small number of hours that the plant would have to be operated for street railway service. This might be better economy than to pay the fixed charges that would accrue from the expensive development of water powers at possibly much greater distances.

It is to be noticed in this connection that the cost of installing the steam station would be considerably less when located at the coal mine, since it would then be unnecessary to equip with the most economical and expensive machines.

Water power produced in various parts of the country varies greatly in its cost. It is reported that the electrical energy so produced costs from \$14 to \$32 per annum per k. w. continuous output. This expense is largely made up of fixed charges, which increase

rapidly as the expense of making the necessary improvements is greater. The standard steam plant produces power with \$3 coal for \$29, and with 80 cent coal for \$22 per k. w. per annum, which compare very favorably with the above for water power.

A disadvantage occurring in the use of water power is that in some cases, on account of certain periods of low water, an auxiliary steam plant has to be kept in reserve, which is of course an additional expense.

There can be no general rule given that will determine whether it is more advantageous to use water or steam power. Each case must be figured by a competent engineer and decided on its merits.

The great majority of street railways being operated by steam I shall not dwell longer on water power, as there is still considerable ground to be covered in the consideration of the steam stations.

I have compiled and classified the data on representative ones throughout the country; Tables I. and II. give the results.

The general arrangement of the tables is as follows: Each vertical column contains the data for a different station during a stated period. Each station is represented by a number which appears at the head of the column, only a portion of the table is exhibited to you on the large diagram, for obvious reasons, but I will describe the different items as they appear in the completed table. The first column is headed S, for Standard Station, following down the column first comes the capacity expressed in multiples of 1,000 k. w., 3.6 meaning 3,600 k. w. The number of units of engines, 3; ditto for generators, 3; number of units engine per 1,000 k. w. capacity is .83, obtained by dividing 3 by 3.6; ditto for generators, .83. The next line under "Type" is a description as to whether the engines are belted or direct connected to the generators; B for the former, and D. C. for the latter. The two lines marked S. C. T. and N. or C. refer to engines, simple, compound or triple; nonecondensing or condensing; as in standard C C is compound condensing.

The period during which the averages are taken is given in days. Load factor is in per cent. Inserted in the proper place under costs are the per cent S, and per cent total, which figures represent the per cents the items bear to the corresponding ones for standard, and to the total operating expense respectively.

The number of shifts, duration in hours and shift hours, together with the rate of pay of men in cents per hour, and number of men per shift per 1,000 k. w. capacity complete the data necessary for the analysis of the cost of labor. Costs are all expressed in cents per k. w. h. Opposite Fuel, lbs. of coal per k. w. h. and price, which is in dollars, per short ton, are the necessary figures to analyze the cost of fuel per k. w. h. Kind, A or B, refers to anthracite or bituminous.

Repairs, supplies, other than coal; that is, water, oil, waste, lamps and miscellaneous, as well as superintendence and general expenses are treated as one item hereafter called general expense.

As a supplement to the tables, in order to more clearly illustrate the relation of the costs, I have constructed diagrams, in which these are represented by shaded lines.

It will be noticed that these shaded lines are of various heights their height corresponding to the cost of the power in cents per k. w. h. The solid black indicates the cost of coal; the white portion cost of labor, and the upper shaded portion, general expense. These which are operating expenses are laid out above the line, and the lower shaded portion indicating fixed charges is plotted below the line. The distance from the base line O up to 1 represents 1 cent and the magnitude of each item is denoted by the length of its block. The diagram for Table I is laid out in six groups, one group for each station. The first or left hand column in each group represents the costs for the standard station. You will notice that its total length, including interest, is about equal to the distance between O and 1 so that including fixed charges the cost of power per k. w. h. per annum for the standard station amounts to about 1 cent. It also appears that the fixed charges are approximately equal to the coal. Labor is roughly about half the coal, and general expense about half the labor. These proportions are simple and easily remembered and we might expect them to hold approximately for stations under similar governing conditions.



I shall next call to your attention station No. 3, whose equipment differs from the standard as follows: It has two units instead of three. Each generator is 800 k. w., making a capacity of about half that of the standard. The generators and engines are direct connected, latter being compound condensing, smaller of course than one standard, but in other respects similar. Three 500-h. p. water tube boilers, economizers and heaters complete the important part of its equipment.

Shaded group No. 3 indicates the cost of power for this station. At the extreme left is standard. The next column showing costs per k. w. h. averaged for one year. At the extreme right of the group is the average for a light month and at the left of this is the month of high output. It is to be noticed that the total cost of operation for the year is somewhat greater than standard. Coal expense practically the same. Labor and general expense somewhat higher. Coal expense being the same does not in this instance indicate that the economy of the station is as good, as by referring to the table, it will be seen that the lbs. of coal per k. w. h. is 2.61 as against 2.2 for standard. This increase is, however, nearly balanced by the reduction in the price per ton which was \$2.60 as against \$3 for standard. It might be expected that on account of the diminished size of the station the labor expense would be larger, on account of requiring more men per 1,000 k. w. An examination of the table shows, in fact, that the men per 1,000 k. w. is nearly double what is required for standard. This would double the labor expense, providing the rate of pay and load factor remained the same, but by a coincidence the rate of pay is lower and the load factor enough higher to bring the labor expense down to nearly standard figures. To illustrate the effect of a high load factor in reducing the cost of labor per k. w. h., it will be interesting to look at the next shaded column for this station, which represents the cost during January. In this month the load factor was 59, against 46 for the year, and it will be noticed that the labor is reduced to less than the standard. The reduction in the total cost for this month, as against the yearly, is also apparent, and this is due principally to the reduction in labor.

It will be seen that the coal expense is but slightly less and seems not to be much reduced by the increased load factor. The explanation of this lies in the fact that the station is tied in with others which keeps its load from fluctuating even on the low load factor. This will be still further exemplified by referring to a light month, the column at the right of the group gives the costs for September during which the load factor was 43 as against 59 for January. The coal expense is still further diminished, and by reference to the table, will be found to be due to an increase in the efficiency of the station. This might be found to be on account of not having to force the boilers. The increase of labor due to the low load factor is to be noticed.

I wish to say at this point that it is impossible for me, in the limited time, to give you more than a general idea of the large number of interesting facts which may be obtained by careful study of the tables.

Plant No. 2 is somewhat larger than the last and is equipped with two 1,000-k. w. generators direct connected to compound condensing engines. It has also economizers and heaters. Its costs are in column No. 2. In looking at the yearly average it will be noticed that the total costs rise above the standard, and is due to an increase in labor and general expense. Coal, as before, is the same, the decreased efficiency being balanced by the lower price per ton. Examining the table with a view to accounting for the increase of labor we find the load factor approximately the same as standard, but an increase in the number of men per 1,000 k. w. This is accounted for by the smaller size of the station. General expense is greater, as would be expected. A glance at the shaded diagram representing the heavy month for this station gives a nice illustration of the effect of the high load factor which is 51 as against 33 for the year. It is to be noticed that the coal is practically the same, the reduction coming in the other two items.

This brings the total cost for the month below standard. In the light month with a low load factor of 28 per cent, the labor increase is very apparent.

I shall now present the costs of operation of a large station.

Its equipment consists of six 1,200-k. w. generators direct connected to triple condensing engines, two 1,500-k. w. generators direct connected to compound condensing engines, and an auxiliary plant of forty 62-k. w. generators belted to compound non-condensing engines and only used in case of emergency. Economizers, heaters and electric feed pumps complete the important part of the equipment.

Shaded group No. 4 indicates the costs for this station. The yearly average shows that we are approaching standard figures in labor. This item is not much less as the units are only slightly greater capacity. Load factor, rate of pay, and men per 1,000 k. w. correspond very closely with standard. The general expenses and coal bring the total somewhat higher. General expense is high on account of the heavy repair account. The station is about eight years old and repairs are heavy, due to replacing of worn out parts. The decrease in efficiency, as shown by lbs. of coal per k. w. h., might be shown by a test to be due to old boilers.

The plants just considered have all been direct connected. Station No. 5 is a belted plant a little more than one-half the capacity of the standard, equipped with seven 340-k. w. generators belted to a countershaft, to which are belted three triple condensing engines. The auxiliary apparatus affecting the economy of the station, being economizers and feed water heaters. Shaded diagram No. 5 represents the cost of a year, and also for the heavy and light months. During the three periods the coal expense remains about the same, but there is considerable variation in the other items, due principally to the change of load factor.

Notwithstanding the high load factor, 52 per cent, the labor for the year is still above standard. This would be expected from the multiplicity of parts to look after in a belted countershaft station. The reduction of general expense and labor in the heavy month is due to the load factor of 64 per cent.

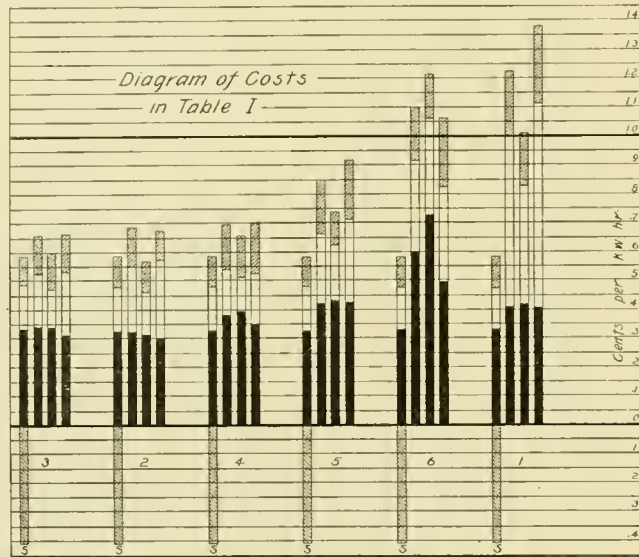
Diagram No. 6 represents the costs for a belted plant of about one-fifth the capacity of standard. Its equipment is 12 generators belted to four simple high speed non-condensing engines. There are feed water heaters but no economizer. High coal consumption is the feature of this diagram. The cost of fuel alone for the year being equal to the total operating expenses for standard. Labor is also high, and the total cost of power per k. w. h. is nearly double the operating expense of standard. This station furnishes a good illustration of the effect on the cost of power of a simple non-condensing belted equipment. It is to be remarked also that this plant has the benefit of a high load factor.

It will now be interesting to turn our attention to a small direct connected station which is numbered 1. This operates about 30 cars. It is equipped with three 200-k. w. generators, has compound condensing engines, heaters, but no economizers. It does not feed in with other stations, as do those which have been previously mentioned, and has a very fluctuating load, as may be imagined in the operation of so small a number of cars. This station is just one-sixth the size of the standard, and it will be noticed that the column representing its operating expenses is about twice as high. The great increase is in the labor, although the station is operated by a corporation which has had a vast amount of experience in railroad work. Can we account for this increase in labor? By referring to the table we find the rate of pay of men is practically the same as standard, the load factor is low, 22 per cent, as against 33.

Referring to the heavy month for this station, which has the benefit of a 30 per cent load factor, we find that the labor is reduced, but it is still a long way from bed-rock figures. The examination of the table discloses the fact that the increase comes in the men per 1,000 k. w., being about 2.5 times the standard figure. The station records show the following men operating: On the first shift two engineers and one fireman; second shift, one engineer, one oiler and one fireman; third shift, one engineer and one fireman. Can this number of men be reduced? In a station whose equipment requires that the boilers be hand fired it is to say the least, difficult to imagine that the boilers could be operated with less than one fireman per shift. The secret, then, for the large number of men per 1,000 k. w. lies in the small capacity. These same men could look after a station of greater capacity.

I shall next give the costs on plant No. 12, whose figures are presented in Table II. This plant is about a third the size of

standard. It does not feed in with other stations. Its generators are belted to three tandem compound condensing engines which operate under steam pressure of 110 lbs. It has water tube boilers averaging four years of service, heaters, but no economizers. A good quality of bituminous coal is used, which costs \$2.93 per ton. By reference to the table it will be seen that this station produced power to the extent of 23 per cent of its capacity during the past year at 1.49 cents per k. w. h., including fixed charges. The operating expenses alone amounting to a little over 1 cent. The total cost of operation for the year was \$23,000, of which \$12,610 was for coal. Water costs this station nothing and the labor was about one-half the coal bill. By referring to the shaded



ed diagram No. 12 it will be seen that the coal and labor are both much higher than standard, and if standard performance had been reached a saving of \$10,000 would have been made in the operating expenses for the year. An analysis of the items is given in column No. 12 of the table, and by comparing with standard the differences may be readily seen. I do not wish to be understood in making these comparisons that it would necessarily pay to make the changes required to effect this saving, my present idea being to bring clearly before you the differences.

Station No. 13 is an interesting combination of cheap coal, simple non-condensing engines direct connected to the generators together with a high load factor. Its capacity is 70 per cent of the standard, major part being three 800-k. w. generators, the smaller unit is 200-k. w. It produced power to the extent of 42 per cent of its capacity at .95 cents per k. w. h. inclusive of depreciation and fixed charges. The depreciation is charged in at 5 per cent on a capital expenditure of about \$60 per k. w. The total expense for the year was \$92,617.28, which is made up of—

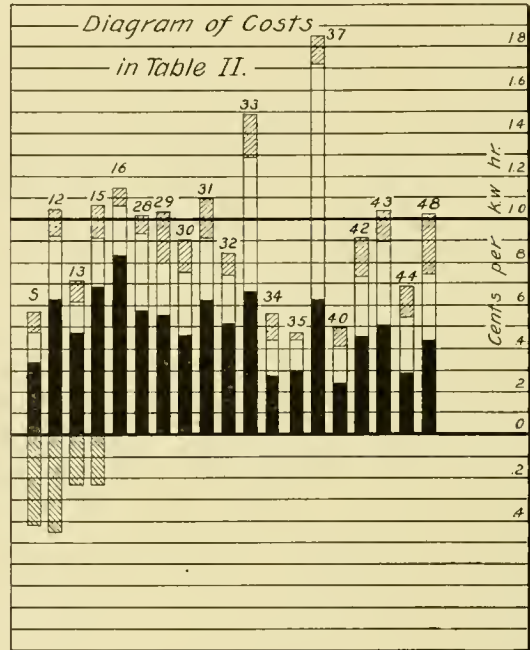
Labor .....	\$15,453.25
Repairs and renewal of steam plant.....	1,839.69
Repairs and renewal of electrical plant....	56.71
Fuel .....	44,780.94
Water .....	4,405.40
Oil, waste and lubricants .....	1,881.53
Tools, appliances and supplies.....	634.23
Taxes .....	1,945.65
Insurance .....	2,146.94
Interest .....	11,472.94
Depreciation, 5 per cent on \$160,000.....	8,000.00
	<hr/>
	\$92,617.28

The analysis of these items is given for comparison with standard in column No. 13 of Table II. The shaded diagram shows labor for this station to be equal to standard, principally on account of high load factor, the other differences are also appar-

ent. It is interesting to note that the road operated by this power station used on an average of about 1.3 k. w. h. per car-mile. Total car-miles for the year was 7,207,308, about 10 per cent of this mileage being trail cars. There are other interesting data about this road which time will not permit me to review.

Plant No. 15 is an interesting example of what a multiplicity of units will do for labor, the figure being 6.3 men per 1,000 k. w. The effect of this would be much more apparent on the color diagram were it not for the high load factor and low rate of pay.

Plant No. 16 is of 600 k. w. capacity. The cost for power for



past year was \$53,000. Load factor is the same as standard. Standard operates to produce about double the output for the same figure. Station No. 28 is 1,400 k. w. capacity, has slow speed condensing engines, heaters and economizers. The feed water leaves economizer at the high temperature of 158 degrees. The engines are simple belted to the generators and coal costs but \$1.63 per ton

Plant No. 29 is a compound condensing slow speed belted station of 1,900 k. w. capacity and feeds in with another station. The coal costs \$3.86. Plants 30 and 31 are operated by the same corporation as 29.

No. 32 is a combination of two power houses feeding into the same system. These stations are interesting because these costs are for the past year, and since then these two stations, as well as smaller ones operated by the same company have been consolidated into a large water power plant, from which power is transmitted at 13,000 volts. The two steam stations shown in column 32 have five triple expansion condensing engines. This road operated on about 1.4 k. w. h. per car-mile. The coal costs \$3 per ton. The water power plant which replaced the steam has not been in operation long enough to enable its costs to be given.

Station No. 33 has rather a tall column, due principally to its low load factor of 16 per cent.

Station No. 34, operated at a lower cost than standard on account of the high load factor 57 per cent reducing the cost of labor and low price of coal \$1 per ton.

No. 35 is a plant of 1,200 k. w. capacity, interesting on account of the fact that it has but one unit. It operates with 2.1 men per 1,000 k. w., a load factor of 37 per cent coal, costing \$1.24 per ton. Its costs are quite a little lower than standard

No. 37 is a record breaker in the opposite sense. It is of slightly greater capacity than No. 35, but has three engines and 11 generators which require eight men per 1,000 k. w. capacity. It has a load factor of but 11 per cent during 151 days from January 1



to May 31, 1898. The effect of this on the cost of labor is very apparent.

No. 40 has a capacity of 9,200 k. w. It is direct connected, has economizers and compound condensing engines. Anthracite coal is burned, costing \$1.60 per ton. This plant operates at less than standard figures.

No. 42 is a belted plant, compound non-condensing engines, heaters but no economizers. It has a good load factor, but the effect of the belted and small units shows in all three items.

No. 43 is a combination of alternating and direct current apparatus. It has a low load factor of 15 per cent, the effect of which is noticed on the labor.

No. 44 is a 6,000 k. w. station and although belted, has large compound condensing engines and economizers which, with coal at \$1.60, brings the cost of fuel below standard figures.

It will now be instructive to take a general survey of the color diagram for all stations in table No. 2. No. 37 towers above all the rest. Standard is at the extreme left. Coal in No. 37 is greater than the total operating expense for standard. This station pays \$1.75 per ton, but it uses 7.3 lbs. per k. w. h. Compare this with No. 35, about the same size plant, paying \$1.24 for coal, and using but 4.7 lbs. per k. w. h.

I can hardly ask you to compare the labor, but it is easily seven times as large in 37 as in 35. The local factor of 11 per cent as against 37 per cent would make this item three times as great and men per 1,000 k. w. 8 as against 2.1 would again increase the cost of labor three times. The higher rate of pay in plant No. 35 prevents the discrepancy being greater.

Let us look along the line for high coal cost. No. 16 seems to bear off the palm in this respect; \$3.30 per ton and 5 lbs. per k. w. h. accounts for this. For strikingly low cost we have Nos. 34, 35 and 40.

But I am afraid that I hear somebody remark that I am making comparisons that may result in unfavorable criticism, and that I promised not to do, and therefore I will let the diagrams and tables speak for themselves, and assure you that they will reward careful study.

Mr. Beggs, Milwaukee: I would like to ask whether there will be a reproduction of these tables which accompany the report in the minutes of the meeting.

The Secretary: The tables will be reproduced and everything given in full.

Mr. Sergeant, Boston: Mr. President, I move that the thanks of the Association be tendered to the writers of all the papers that have been presented to this meeting.

Mr. Goff, Fall River: I feel that in relation to Mr. Conant's paper, I would be remiss in my duty as a member of the Association if I did not urge that it should be specially recognized as a most valuable piece of work. Mr. Conant has devoted a very great amount of time to its preparation, and he deserves every credit for the work; but it is a paper of such a nature that we cannot discuss it here. We can discuss it after we have it before us in the printed report of the proceedings, but I feel that there should be a special mention of Mr. Conant's name in this connection.

Mr. Beggs, Milwaukee: I desire to reiterate what my friend has just said. I took occasion to give my personal thanks to Mr. Conant. From my experience as a manager of electric light and street railway plants, I thoroughly appreciate the vast amount of labor which he has expended upon the tables in compiling the data from various companies which is not always placed as clearly as it might be before persons who are going to perform a service of this kind. Mr. Conant's paper is worthy of special mention. It is hardly practicable to discuss the paper in this meeting. It is rather a paper which we can take up with our technical men, our engineers and men in charge of power houses, and I believe if the paper is thoroughly considered it will result in a large saving of money to every railroad company which takes the subject up in that way. I desire to second all that has been said in regard to the importance of the paper, and the careful manner in which it has been prepared, also for the way in which it was presented to this meeting.

Mr. Sergeant's motion was put and carried.

Mr. Conant, Boston: I wish to thank the members of the Association for their very kind words and also for their uniformly courteous replies which I have received from them when I have sent requests for this data.

The President: We will now take up the report of the Committee on "Standard Rules for Government of Conductors and Motormen," of which W. J. Kelly, of Columbus, O., is chairman. I understand that Mr. Kelly is indisposed this morning.

Mr. McCormack, Brooklyn: Mr. President, I am a member of the committee, and have been looking for Mr. Kelly, our chairman, who has formulated a set of rules and regulations for the government of conductors and motormen to submit to the convention. It was the intention of the committee to ask that the rules as formulated be submitted to the convention, and we would ask that the committee be continued for another year, and that the sum of \$200 be given to the committee to have the rules printed and mailed to the Association in order that any suggestions or criticisms might be made; and after it is printed, if any members of the Association desire to adopt the rules in part or in their entirety, they can do so. It was our idea that after the rules are printed and subjected to this criticism that the Association can pass on the adoption of the rules next year. The committee thinks that the rules should be taken up separately and a discussion had on each rule and each rule adopted or rejected by the convention, somewhat in the same way that the standard code of rules was adopted by the Superintendents' Association of steam railroad men.

Mr. Goff, Fall River: I move that the committee be granted the extension of time asked for, and that we appropriate the sum of \$200 as it requests. Mr. Beggs seconded the motion, which was adopted.

The President announced that it was the desire of the Secretary that members of the Association should indicate topics upon which it would be desirable to have papers prepared for the next convention, and that they should also suggest a person who would prepare the paper.

Mr. McCormack, Brooklyn: I offer a motion that the thanks of the convention be given to the press of Boston for the intelligent manner in which they have written up the proceedings of the convention. Carried.

The President: The only remaining thing for us to do is to install the newly elected officers, and the installation of the officers is usually represented by the installation of the President. I will appoint Mr. Chapman, of Chicago, and Mr. Davis, of Williamsport, a committee to escort the newly elected president to the chair.

The Secretary then read the names of all the officers elected.

The President: Gentlemen: It is needless for me to introduce Mr. Sergeant to you, but I desire to say that I appreciate the high honor you conferred upon me a year ago in electing me to this office, and I bespeak for Mr. Sergeant your kind and considerate attention to his communications. If you do as much for him as you have done to make this Boston meeting a success, we shall have a splendid meeting at Chicago next year.

President Sergeant: Gentlemen and Members of the American Street Railway Association: I wish to thank you most heartily for my sudden elevation to office. I feel proud to be permitted to serve you for the coming year. I cannot hope, perhaps, to give as good an administration as my immediate predecessor, Mr. Lang, whose efforts in behalf of the Association I am sure you all appreciate, and the success which has crowned these efforts, and the long line of past presidents, is one which fills the mind of a new incumbent with some embarrassment, based on the idea that there is a standard which must be upheld.

As to this Association, I feel strongly that it has a great work to do, that its meetings are not merely a pleasant vacation, that it is not called together merely for the purpose of reading and discussing the papers, but I believe in the complex relations which are continually coming forward as between the committees and the municipalities and the state governments and the street railways, that much is to be gained by concerted action. Certainly in Massachusetts we have benefited very greatly from the fact that our street railways have pulled together for what they know was right and they have succeeded, after a struggle covering many years, in obtaining a settlement which I suppose

looked at from all sides could be called a fair settlement of the relations of the street railways and the community. I hope that the trial which is being made here of this new plan, by which the oppressors of the street railways in a great many communities have been shown by an act of the legislature how far the street railways are liable to perform work which is not in the line of street railway practice, and by which the street railways themselves are compelled to pay a portion of their receipts for the benefit of the highways. It seems to me that all this work which has been done is instructive and is the beginning of a proper recognition of our industry over the whole country. I assure you, gentlemen, when I first went into the street railway business, particularly in the operating department, I was perfectly appalled; it seemed to me I was in an unlawful business, and everybody was down on the street railway, for it was hampered and troubled by one requirement and exaction after another, and when we made complaints, the answer to it all was: "You are in the public streets, you encumber the streets, and you must pay for it." How much better it is to know what we have to pay for than it is to be put to such payment that may devolve upon us in the judgment of some subordinate road department official in some municipality. I think in such ways as that, and in this matter which was taken up the other day, of the mail service, simply in having our case presented, in order to get proper recognition, the Association has a field, perhaps greater than any it has yet filled, and I can only say in closing that so far as it lies in my power to further the work of the Association and benefit the interests of street railways, I shall certainly do so. I thank you very much, gentlemen, for the honor.

Ex-President Lang: I now declare the newly elected officers to be duly installed, and take pleasure in handing to the new presiding officer the gavel, with my best wishes.

President Sergeant: I believe that the constitution of our Association provides that the newly elected officers shall enter upon their duties after the annual meeting is adjourned. And it seems almost as if some duties were about to be forced upon me, I suppose for that reason a motion to adjourn would be in order.

Mr. Goff, Fall River: I move you, Mr. President, that we now adjourn to meet in Chicago in 1899. Carried.

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### THE EXCURSIONS.

#### Boston a Royal Entertainer—Trips by Land and Sea—A Multitude of Pleasures.

When in session the conventions buckled down to hard work, but when the work was finished for the day our hosts occupied every minute with some new delight and pleasure. Boston and its immediate surroundings are so full of places of rich historic interest that the cream of them was scarcely skinned in the five days which her guests had to spend. The excursions and side trips, however, were so admirably planned and carried out that visitors were treated to the most delightful pleasure trips without any thought or care other than to be on hand at the leaving time. At no convention have the excursion schedules been so faithfully carried out as here. The entertainment, from which nothing was left which could possibly be suggested, was given by the Massachusetts Street Railway Association, with the Boston roads, of course, at the head of the list, but a large number of officials of companies in adjoining cities served on committees. It would be a genuine pleasure to recite at considerable length the details of the excursions, but even then no pen or brush could ever portray the indescribable charm of the quaint surroundings of Concord or the patriotic atmosphere of Lexington, hence we will content ourselves with a brief outline of the various trips.

Every attention was provided for the visiting ladies and a large local committee met the guests at the several hotels Tuesday morning and a general introduction followed. In the afternoon all went to Lexington and Concord, in special cars to the depot and a special train to destination. About 1,000 were in this party. The first stop was Lexington, where the historic land-

marks on the Common were seen. A pleasant feature here was the presence of Rev. Dr. Calvin A. Staples, the town historian, and whose personal resemblance to Henry Ward Beecher was noted by many. Standing at the monument and facing the lotty flag pole on which was inscribed "The Birthplace of Liberty," he explained the many interesting places, and briefly recited the history of each. President Lang, on behalf of the Association, expressed thanks. Returning to the train the trip was continued to Concord, where conveyances took the entire party on a drive through the county. Among the places visited were the First Church; home of Ralph Waldo Emerson; "Wayside" home of Hawthorne; battle ground; The Old Manse; Sleepy Hollow Cemetery; Block House; home of Thoreau; and many others. The return to Boston was followed by a general reception in the evening in the Paul Revere Hall with music and dancing. The ladies receiving were: Mrs. W. B. Ferguson, Mrs. E. P. Shaw, Mrs. John Graham, Mrs. E. C. Foster, Mrs. Frank Woodman, Miss Elizabeth Staw, Mrs. Charles Richardson, Mrs. Fred. Hines. Refreshments were served in the banquet hall adjoining and the table was really a dream of the caterer's art. The festivities lasted until after midnight.

Wednesday morning the ladies were shown many of the local points of interest, and in the afternoon everybody went to Nantasket to the clam bake. Special care were provided to Rowe's Wharf, where the splendid steamer Myles Standish was tendered for the exclusive use of the street railway people. This steamer trip was tendered by the municipality of Boston as a compliment to the Association—an entirely new honor for the convention—and Mayor Quincy graced the occasion with his presence. At Nantasket the freedom of the place was extended, and while the little buttons worked charms our money would not go. Fully 1,200 made this trip and were given a shore dinner—something quite novel for many. Col. Heft, of the New Haven road, had a special train at the beach for a run to Braintree on the third-rail system, accompanying the party himself. The change in the weather on Wednesday afternoon from extremely hot to bracing cool, was a grateful one.

Thursday morning the ladies took tally-hos and enjoyed a parkway drive, going through Brookline and Jamaica Plain. In the afternoon everybody went to Plymouth on a special train, walked over the Plymouth Rock, visited the old cemetery, and other historic points, and returned with swords and other curios secured at the curiosity shops. In the evening occurred the annual banquet mentioned elsewhere.

Friday morning the ladies were conducted on a shopping trip and in the afternoon we all went out to Norumbega Park, taking special cars on the city line and changing to those of the Commonwealth Avenue Company. The distance was about 11 miles, and took the party along Beacon street, Commonwealth avenue and the Chestnut Hill reservoir. The scenery was most charming. At the park a performance was given and the return was made in time to dine and attend Keith's theatre, where the entire lower floor had been reserved for delegates. After those unfortunates who did not wear buttons had departed, the entire house and stage were inspected and a special illumination made to the great delight of the guests.

After all the delights of the week, many visitors were prevailed on to remain over Sunday, and were entertained at the homes of their friends. Altogether the pleasure features of this convention have never been equalled, for no other city has so many historic points to show; and the visitor might well say his experience was "one continued round of pleasure."

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### THE BANQUET.

The annual banquet of the Association was given on Thursday evening at the Brunswick; about three hundred were present. The decorations, music and menu were pleasing and the toasts as follows:

The Commonwealth, His Excellency, Governor Roger Wolcott.

The City of Boston, His Honor, Mayor Josiah Quincy.

Rapid Transit in Boston, Hon. Geo. G. Crocker, Chairman Rapid Transit Commission.



The New England Bar, Hon. Samuel J. Elder.  
Orators and Oratory, Hon. P. A. Collins.  
The New England Press, Stephen O'Meara, Boston Journal.

Great disappointment was felt at missing the speech of the Governor, but he left early to welcome home what was left of the Ninth Massachusetts, which arrived about 10 o'clock that evening. The Governor, by the way, makes it a point to shake every returning soldier by the hand, and in these days soldiers deserve preference over banquets.

The toasts were good, and as the banquet room was opened promptly at 7:30 p. m., it was only midnight when the diners rose to sing "America."

## THE BUREAU OF INFORMATION.

Of all the thoughtful provisions made for the comfort of visitors, none was more valuable or better appreciated than the Bureau of Information. This was located in convention hall, in charge of Robert H. Derrah, chief executive clerk of the Boston Elevated Railway, and the management of the bureau could not possibly have been improved upon. The office was an especially built room, 15x25 ft., and both the building and decorating plans were Mr. Derrah's. Here one could find out anything and everything. A long distance telephone was installed, stenographers



MR. DERRAH'S HEADQUARTERS.

were at hand for dictation of letters or other matter, folders and time tables of all leading railroads and steamship lines in the country, and a bulletin board contained daily announcements of what was being done in the convention, and notices of the program of the day. The interior furnishings of the apartment were extremely harmonious and pleasing. Our view shows Mr. Derrah occupying the arm chair, and around him some of his assistants. As many more were on the staff, but were absent on assignments. It is certain there will never be another convention without its Bureau of Information.

Hugh H. Harrison, secretary of J. G. White & Co., 29 Broadway, N. Y., was at the Boston convention.

## CONVENTION NOTES.

The buttons provided by Secretary Penington bore a picture of Bunker Hill monument, and were backed by a small flag. These buttons were good for transportation of the wearer during convention week on every street railway in the State of Massachusetts. As an instance of the thoroughness with which everything was planned, it is interesting to note that every conductor in the city of Boston was required to receipt for a bulletin notice as to free transportation on the buttons. The result was, not a single instance occurred in which delegates were asked to pay fare. The freedom of the Boston lines is further emphasized in the fact that free transportation on the road is unknown. All the officers, from the president down, pay cash fares when riding; employes sent out on the lines to work are, of course, given trip passes.

We were all impressed with the uniform courtesy of the employees of the Boston Elevated, and the unusual fine character and neat appearance of the men. They appeared to take a lively interest in their work and anxious to keep their positions. On the other hand there was a marked politeness and regard for the individual rights of others on the part of the public not generally prevailing in many parts of our country.

Among the old timers present who used to attend early conventions were Mr. Payne, of Milwaukee; D. F. Longstreet, Providence; and Mr. Wharton, Philadelphia.

Col. D. B. Dyer, Augusta, Ga., was unable to attend and sent letters of regret.

A western manager remarked on the few exhibits of emergency apparatus. He would liked to have seen more of them.

A. E. Baker, London, connected with various tramway interests in England, was present with his brother, J. Paul Baker, of the Baltimore Car Wheel Company. Mr. Baker returns about Christmas.

The Massachusetts and nine cruisers, and the hospital ship Solace, lay in Boston harbor during the convention, and were open to visitors several hours each day. On the trip to Nantasket a fine view was had of the fleet.

There was the usual crop of souvenirs this year, some of which were quite expensive, and several original and unique.

The proximity of Trinity church, Museum of Fine Arts, and the Public Library to the headquarters hotel afforded many visits during half hours which would otherwise not have been as pleasantly occupied.

The Lynn & Boston is the only road, other than the Boston Elevated, whose cars use the subway.

C. S. Clark, chairman of exhibits, returned from Europe a few days prior to the convention, greatly improved in health.

Koran Sugahara, chief engineer of the Koku and the Buse Chuo Railway Companies, Tokyo, Japan, and T. Y. Dzushi, chief of finance and stores of the Imperial Japanese Government Railways, attended the convention and were given the freedom of the floor. Mr. Sugahara addressed the meeting.

## SWINDLER RICE KILLS HIMSELF.

Charles F. Rice, otherwise known as Lause, Kramer, Wright, Powers, Smith and Bidwell, whose career as a swindler of transportation and insurance companies was mentioned in our August issue, committed suicide by taking morphine while confined in the county jail at Saginaw, Mich., where he was held on the charge of assault and battery.

## THE ACCOUNTANTS' CONVENTION.

The Second Annual Meeting of the Street Railway Accountants' Association of America—Good Attendance—Exhaustive Report by the Committee on Standardization of Street Railway Accounts.

The Street Railway Accountants' Association of America held its second annual meeting under the same roof as the American, and at the same time. The attendance was good, about 40 being present, including one lady auditor.

The sessions were devoted to hard work, and lots of it; indeed, any one who looked in the first two days beheld a body of handsome young men who had shed coats and vests, for their room was on the sunny side.

President Wilson, of Boston, presided in a most acceptable manner, and Secretary Brockway had carefully prepared all the arrangements.



J. F. CALDERWOOD.  
President-Elect.

The principal feature was, of course, the report of the committee on standardization, of which C. N. Duffy, St. Louis, was chairman. It was a matter of universal regret that Mr. Duffy, who has worked so hard on this report, could not be present to share the honors of the report which was presented by Mr. Ham, of Brooklyn.

Mr. Seymour, of Connecticut, was present at the reading of the report on standardization, representing the Association of Railroad Commissioners, and addressed the convention, paying a very high tribute to the work of the committee, and expressing the good will his association entertained toward the Accountants' Association.

On Monday the Executive Committee met in annual session. Tuesday morning the convention opened with the president's address, secretary's report, and the reading of Mr. Hibb's paper by the secretary in the absence of the author. Wednesday the Committee on Nominations and Resolutions was appointed; the Executive Committee reported, and Mr. Ford's paper was read and discussed. Thursday and Friday were devoted to the standardization of accounts. The discussions during all the sessions were extremely interesting and valuable, and can only be obtained in full on application to the secretary of the Association, as publication has been reserved.

The new officers are as follows:

President, J. F. Calderwood, Minneapolis.

First Vice-President, E. R. Tighe, Brooklyn.

Second Vice-President, R. L. Williams, Richmond, Va.

Third Vice-President, F. E. Smith, Lynn.

Secretary and Treasurer, W. B. Brockway, Toledo, O.

Executive Committee, officers and H. L. Wilson, Boston; H. E. Babcock, Elmira, N. Y.; H. O. Mackay, Milwaukee, and J. D. Fraser, Ottawa, Can.

The meeting next year will be in Chicago; date not yet determined.

A permanent committee, of which F. E. Smith, of Lynn, is chairman, was appointed to take charge of the constantly increasing collection of forms and blanks. The exhibit this year was better than ever before and carefully studied by members.

### PRESIDENT'S ANNUAL ADDRESS.

Why this Association has continued to shower honors on my unworthy head is something I have been unable to understand. When I found it would be impossible for me to be present at the first annual convention of the Association at Niagara Falls last year, I naturally supposed that my career as presiding officer had come to an untimely end, and the only reason that has occurred to me since why this was not so, is that you all felt so sorry that it was necessary for me to forego the many instructive features as well as the many pleasures which you, who were present enjoyed on that occasion, that from pure sympathy you concluded to give me another opportunity to occupy the chair.

You have my assurance that whatever the reason may have been, your generosity was fully appreciated, and I thank you for the double honor you have conferred upon me.

The interests of all persons connected with the street railway business are, or should be the same, and it is a pleasure to note how much closer the accounting and operating departments are constantly coming together. Accounting is now looked upon as a much more important branch of the business than was the case a few years ago, and we must make it the aim of the Association to make it still more important each year. In order to accomplish this much desired end we must steadily look forward and use every endeavor to shorten, improve and perfect our methods in such a way that the results will give more complete information, in as concise a manner as possible, to all departments of the company.

That a good thing is good enough is a mistake we must not allow ourselves to fall into. How many of us today would be satisfied with what our grandfathers considered was good enough for them?

Most of you are thoroughly familiar with what this Association has already accomplished, and while some may possibly think that the improvement has been so rapid, that it may have been caused by the enthusiasm of youth and cannot continue in the same ratio, I for one think that we have only begun the good work and that it is bound to continue if only the same interest is shown in the future as has been shown in the past by all our members.

The committee appointed to further consider the question of a standard system for street railway accounting has been very active during the past year and three of the five members, namely, Mr. Duffy, Mr. Ham and Mr. Davies, have worked very hard in trying to perfect what the previous committee so ably accomplished, in the short time they had to devote to this subject previous to the last convention.

They have consulted with members of the Association of State Railroad Commissioners, with the Interstate Commerce Commis-



sion, and with members of the Association of Railway Accounting Officers and have asked for suggestions from all our own members, and have carefully considered all questions which have been submitted to them.

They held a meeting in New York a few weeks ago and met again at Cleveland only a few days since. They have rendered the Association much valuable service at no inconsiderable sacrifice to their time, and have refused to allow the Association to pay the personal expenses of their meetings, and they should receive our unbounded thanks for what they have accomplished. The report which they will submit is the most important matter we have to consider, and I trust that every one present will have some views on this subject, and will not hesitate to give us the benefit of their ideas.

The Association has continued to grow in a manner that is quite encouraging, and if it is not all that we might have hoped it would be at this time, it is at least quite gratifying that the membership has steadily increased, and that while its growth may have been somewhat slow it is still very healthy and the scope of the territory covered is constantly widening. Before the final adjournment I hope that our membership may be doubled, and we ought to feel that if we can induce any of the railway officials who are now in this city to join our Association we are doing them and their company a favor, as I feel assured they will consider themselves well repaid when they know the benefits to be derived from a membership in our Association.

During the year we have admitted another company from the Republic of Mexico, and one from the city of Honolulu, in the Hawaiian Islands. I do not know whether our having admitted this latter company to our Association was all that was necessary to influence Congress to annex these islands, but it is a fact that it was only a very short time afterward that they obtained the recognition they had so long sought.

It is with the deepest regret that I have to announce that the grim messenger of death has entered our ranks and taken from us three members: Morris W. Hall, of Camden, N. J.; James A. Stratton, of Birmingham, Ala.; and C. B. Reavis, of Atlanta, Ga. All of these gentlemen were deeply interested in everything pertaining to the welfare of our organization, and many of us feel a personal sorrow at the loss of our friends.

The American Street Railway Association clearly demonstrated by the recognition they accorded our Association at the last convention that they have a kindly interest in our well being, and we shall always consider that we owe them a deep debt of gratitude for all the delicate attentions they have shown us.

The two leading street railway publications have also shown us many favors, and have done all that lay in their power toward bringing our organization prominently before the railway fraternity of the country, and I take this opportunity to thank them in the name of the Association.

I shall not consider my duties completed without first calling your attention to what our secretary and treasurer has done, and is still doing, for us. To his tireless energy we owe to a large degree our present high standing and the tasks which he is constantly imposing upon himself would well tax the strength of a much stronger man.

### Report of the Secretary and Treasurer.

In reviewing the transactions of this office for the second year of the Association there is much to encourage us to continued effort in the extension of the interest in our aims and reasons for organizing. That the importance of the results we desire to reach and that our aim to be of more assistance to the street railway properties of America is being appreciated can best be shown by the following statement of our membership:

Total companies joining at Cleveland, O., March, 1897.....	25
Number joining between Cleveland and Niagara Falls meetings .....	12
Number joining at Niagara Falls, October, 1897.....	16
Number joining since Niagara Falls meeting.....	16
—	
Total .....	69

Less Cincinnati Street Railway Company, withdrawn.....	1
—	
Total membership September 2, 1898.....	68

The companies joining at and since the Niagara Falls meeting are:

Brooklyn City & Newtown Railroad Company, Brooklyn.	
Columbia Railway Company, Washington	
Wilmington City Railway Company, Wilmington, Del.	
Tonawanda Electric Railroad Company, North Tonawanda, N. Y.	
Milwaukee Electric Railway & Light Company, Milwaukee.	
Manchester Street Railway Company, Manchester, N. H.	
Memphis Street Railway Company, Memphis, Tenn.	
Hamilton Street Railway Company, Hamilton, Ont.	
Fitchburg & Leominster Street Railway Company, Fitchburg, Mass.	
Denver Consolidated Tramway Company, Denver, Col.	
Colorado Springs Rapid Transit Company, Colorado Springs.	
Columbus Central Railway Company, Columbus, O.	
Metropolitan Railroad Company, Washington.	
Union Depot Railroad Company, St. Louis	
West Chicago Street Railroad Company, Chicago.	
Cicero & Proviso Street Railway Company, Chicago.	
Capital Traction Company, Washington.	
Brockton Street Railway Company, Brockton, Mass.	
Detroit Citizens' Street Railway Company, Detroit.	
Atlanta Railway Company, Atlanta, Ga	
St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo.	
United Traction Company, Pittsburg, Pa.	
Hartford Street Railway Company, Hartford, Conn.	
Salt Lake City Railroad Company, Salt Lake City, Utah.	
Aurora & Geneva Railway Company, Aurora, Ill.	
New Orleans & Carrollton Railroad Company, New Orleans.	
Hawaiian Tramway Company, Honolulu.	
Market Street Railway Company, San Francisco.	
Oakland Transit Company, Oakland, Cal.	
Federal District Railways of the City of Mexico, Mexico.	
Haverhill & Amesbury Street Railway Company, Amesbury, Mass	
Concord Street Railway Company, Concord, N. H.	

Thus our membership includes nearly all of the states in the Union, several cities in Canada, two in Mexico and one in the Hawaiian Islands. Inquiries have been received from Europe, Brazil and Sidney, N. S. W.

A circular explaining our aims, etc., was mailed December 1, 1897, to a large number of the presidents of non-member companies and from this can be traced the addition of several of the above companies. It seems proper to expect that when our position becomes better known our membership will be still more representative and our field of usefulness increased.

The finances to be reported are as follows:

Receipts from new members.....	\$320.00	
Receipts from interest on deposit.....	6.13	
Receipts from 1898 dues .....	460.00	
Balance on hand October 20, 1897.....	222.08	\$1,008.21
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Expended, services secretary 1897-1898.....	200.00	
Expenses of secretary's office and to New York..	181.17	
Printing and stationery .....	50.15	
Stenographer Niagara Falls meeting, Oct., 1897..	201.92	
Printing report of Niagara Falls meeting.....	198.15	
Expenses committee on Standardization of Accounts .....	106.45	
Printing committee on Standardization of Accounts .....	18.50	
Balance in Home Savings Bank, Toledo, O.....	51.84	\$1,008.21
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Dues for 1898 unpaid.....	\$60.00	
Amount in bank .....	51.84	
Total amount due and on hand.....	\$111.84	

Some of the expenses will not have to be duplicated the coming year, so a relatively better showing will be made

The sincere thanks of the Association are due to the members of the Permanent Committee on a Standard System of Accounts for their generosity in paying their own expenses to their meeting held at Manhattan Beach, N. Y., in July, of this year. It is by their action the treasurer is enabled to report a balance on hand.

Three times we have been called upon to feel the loss of one of our members: Morris W. Hall, secretary of the Camden & Suburban Railway Company, Camden, N. J.; James A. Stratton, secretary of the Birmingham Railway & Electric Company, Birmingham, Ala., and C. B. Reavis, secretary of the Augusta Railway & Electric Company, Augusta, Ga., have died. Mr. Hall was the chairman of the organization meeting and Mr. Reavis was the third vice-president for 1897. They were of our most helpful members.

The secretary is deeply under obligation and is pleased to acknowledge the valuable services and encouragement received from the officers of the American Street Railway Association, from H. H. Windsor, of the STREET RAILWAY REVIEW, and E. E. Higgins, of the "Street Railway Journal," from A. O. Kittredge, editor of "Accounties," for the presentation of a book for the Association Library and to the STREET RAILWAY REVIEW for the loan of type matter for use in the annual report. These and others have materially assisted in the handling of the duties of the office.

#### STATISTICS—THEIR USE AND ABUSE.

**E. D. Hibbs, Auditor North Jersey Street Railway Company, Jersey City, N. J.**

In discussing any phase of Accounts it is necessary to bear in mind that the duties of the railway auditor are to see that all moneys due to the company are promptly turned over to the officer appointed as custodian of the company's funds and that the source from whence this money is received should be plainly indicated; that the disbursements of the company's moneys, upon proper authority, be so charged upon the books of the company that each department of the company's service should bear its proper proportion of the expense; that the statements taken from the books of the company show to the stockholders and bondholders, through their board of directors, the financial condition of the company, the source from which its revenue is received and the manner in which it is expended; and that the manager or superintendent be furnished details of expense and revenue that will enable him to operate the road economically.

With these points borne in mind, it will be readily seen that the compilation and proper arrangement of figures, commonly termed statistics, so as to convey to the mind of the party interested information necessary for the proper management of the company's interests, must enter very largely into the Auditor's daily labor.

A bald statement of facts, such as are only too frequently the only information given out from the Accounting Department, if not supplemented by statistical information, will never reveal the weak points in a company's management. I have never known statistics to prove other than valuable information and frequently have been the means of starting investigations that have led to economies that have contributed largely to a company's financial success. It is not necessary, however, to incorporate into a report for the benefit of stockholders and others outside or the direct management of affairs a mass of statistical information that only tends to mystify those not initiated into the technical details of management and divert the mind from the actual financial and physical condition of the property which it is the purpose of the report to expose. But for the guidance and information of the superintendent and others directly in charge of operations, etc., and who are responsible for the result of the management or mismanagement of the company's various interests, statistical information cannot be given in too great detail.

Without opening the question of which is most desirable as a basis for comparison "per passenger carried" or "per car-mile



E. D. HIBBS.

Ellwood Doron Hibbs was born in Bristol, Pa., September 27, 1861. In July, 1879, he entered the employ of the Pennsylvania Railroad Company in the accounting department and remained with the company in various capacities until February, 1895. At that time Mr. Hibbs became auditor of the Consolidated Traction Company, of Jersey City, and at the organization of the North Jersey Street Railway Company he was chosen for the same position. The system of accounts in use by that company is very largely the result of his labor and has proven very satisfactory.

run," I cannot conceive how a superintendent in charge of a division can possibly be in possession of the necessary information to intelligently operate his lines without the knowledge conveyed to him by this means. In addition to this, the general superintendent or manager should have for his information in making comparisons with other lines as to cost of operating, the physical characteristics of the different lines comprising the system of which he is in charge, curves, grades, congestion of street through which they run, etc. The engineer in charge of power houses should know the number of pounds of coal necessary to convert a pound of water into steam, and so on through all the ramifications of the system.

No Accounting Department is fulfilling the purposes for which it was created that does not furnish information of this nature and it should be furnished in the shape of statistics that will enable each man interested to comprehend thoroughly the part he is bearing in the success of the company to which he is attached.

That the value of statistics may not be detracted from by indiscriminate distribution, care should be taken to place before each party in charge of a certain line of work the figures referring to that line of work only. Power house statistics would have no value when placed in the hands of a division superintendent whose duties have no connection with the operation of the power house, and platform or car house expenses convey no information when given to an engineer in charge of power houses. But on the other hand, wattmeter readings and expense statistics of one power station properly tabulated and compared with those of another station bring forcibly to the mind of the man in charge that one station is producing power at a higher cost than the other in some particular and he naturally seeks to remedy it to the manifest better interest of the company.

Statistical information enters largely into an intelligent understanding of the earnings of lines on which transfers are issued and received. Very few roads give credit to the line receiving a transfer issued by a connecting or intersecting line of the same company. To points where summer travel is very heavy, reached by a particular line of cars receiving transfers from feeder lines and on return trips passengers have the option of returning home from the transfer points by more than one line of cars, unless the line receiving the transfer is given a proportion of the original fare, entailing a more detailed audit of transfer business than is practical with most roads, a statistical report of the transfer business is absolutely necessary to explain the difference in earnings. I have in mind a line on which several summer resorts are located that is intersected by two belt lines, one of which carries most of the passengers to the point of intersection while in returning passengers almost invariably use the other belt line. The earnings of the belt line carrying the passengers to the intersection and receiving the original fare shows earnings of 35 cents per car-mile, while the belt line carrying passengers from the intersecting point and receiving the transfer shows earnings of 26 cents and 27 cents per car-mile. The adjustment of the transfers so as to give a part of the value to the accepting line is no doubt the most desirable way to cover the point, but a statement showing the number of transfers carried on each line by car and by trip and the percentage of total



passengers carried on transfers, would reveal the cause of discrepancy in earnings.

The opinion is frequently expressed by persons connected with large systems of street railways that the cost of placing statistical information in the hands of the parties to whom such information is of value, is greater than would be warranted by any benefit accruing to the company from their use. Steam roads have long ago recognized the fact that the compilation of statistics is a necessary expense connected with a well organized Accounting Department and while it bears all the odium attached to a non-revenue producing department, the discontinuance of such information is never contemplated. Street railway systems have the prejudices and traditions of years to combat. Horse railroads as a rule paid dividends to the stockholders and no questions are usually asked in such cases. But today, the capital invested in street railways is so greatly increased that the earning capacity of almost all systems have been taxed to their fullest extent to pay fixed charges, while dividends are not yet in sight. Any agency that contributes to the economical operation of a road is of great importance, and street railway systems must treat their Accounting Department with liberality to enable the parties in charge to aid in producing results for which all are laboring.

Let me say in conclusion that while statistics are not of sufficient value to occupy the first place in the mind of the Auditor, they are of such vast importance that much more attention could be very safely given them than is now generally the case.

### Report of Executive Committee.

To the President and Members of the Street Railway Accountants' Association of America.

The committee met once in Niagara Falls, immediately after the election of officers, and passed favorably upon 14 applications for membership. During the year they have taken three mail votes and have passed favorably upon the application of 15 members. We have also had one meeting at Boston, and passed favorably upon the application of five members, making a total increase in membership during the year of 34 members, there having been no withdrawals.

Considering the fact that the Association is still very young, this showing is particularly satisfactory, and if the members of the Association will show as much interest during the coming year as they have in the past, we believe that before we meet again our membership will exceed one hundred.

Your committee have audited the books of the secretary and treasurer and find them correct in every respect.

We desire to express the appreciation of this Association for the thoroughness and care with which Mr. Brockway conducts the duties of his office.

The meeting of the Association at this time of the month is particularly unfortunate, and the absence of many of our members is due to that fact. We should not be discouraged if our attendance at this meeting is not as large as we had hoped for, while some members may be unable to be present on account of the time of the month, we feel sure that we have their hearty good will, and that they would be present if it were possible.

### CAR MILEAGE—HOW ARRIVED AT, AND ITS USE.

By A. H. Ford, Secretary and Treasurer New Orleans Traction Company, New Orleans, La.

The subject assigned to me is somewhat limited in its scope, being statistical in its nature (as has probably been shown by Mr. Hibbs in his paper) and for that reason, interest in its discussion is limited to the Accounting Department, to whose lot generally falls the preparation of statistics, and the operating department, which makes use of the same in determining the actual status of affairs in its control, or in suggesting needed economies or improvements, which alone are demonstrated by this means.

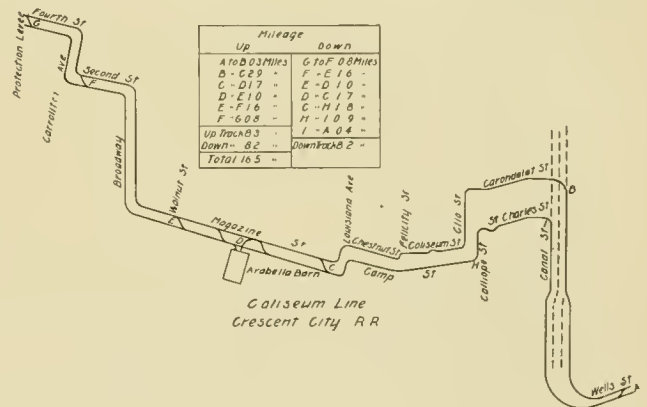
Executive officers and directors, as a rule, do not take the interest they should in the statistical information we place in their hands, daily, weekly, monthly and annually, at the ex-

A. H. Ford was born in New York City July 28, 1859, and received the first rudiments of education at Bridgehampton, Long Island. Very early in his career the family moved to Evansville, Ind., where his common school education was completed. At the early age of 17 he entered the railroad service, holding the positions of clerk to receiver and local ticket agent of the Lake Erie, Evansville & Southwestern Railroad. From 1880 to 1884 he was secretary of the Evansville & Eastern Railroad, assistant auditor of the Evansville, Rockport & Eastern Railroad and, when the two companies were consolidated, he became traveling auditor. From 1884 to 1892 he was successively auditor of the Kentucky & Indiana Bridge Company, treasurer and auditor of the Louisville & Southern Railroad and secretary and treasurer of the Southern Contract Company. Since February, 1893, Mr. Ford has been secretary of the New Orleans City & Lake and the Crescent City Railroads, and on January 1, 1897, he was appointed secretary and treasurer of the New Orleans Traction Company, which position he now holds.



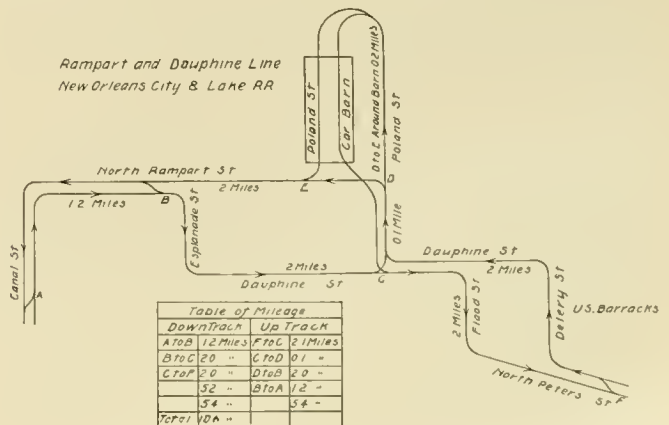
A. H. FORD.

pense of careful forethought, great labor and comprehensive thoroughness. This information is worthy of careful study, which, if bestowed, would in many instances, locate the difficulties which are hindering the financial success of some of our systems. It is true these gentlemen have other and weightier matters to occupy their time and attention, and our statements therefore, in most cases, find slight appreciation and little study from them, but the general manager, or head of the transportation department, who carefully considers them, gets help, and



many suggestions which assist him in the discharge of his responsible duties.

The "Car Mile" with many roads has become the unit of calculation. This should be the case with all, as from the showing made from this unit, figures can be made which will unerringly determine many vexing questions of management.







**New Orleans City & Lake R. R. Co.**

**Comparative Statement  
Earnings, Expenses  
AND  
STATISTICS**

—FOR—  
189 and 189  
—AND—  
From Beginning of Fiscal Year  
(DECEMBER FIRST)  
Including Current Month.

	Comparative Income Account for	
	189	189
<b>EARNINGS</b>	189	189
From Electric Lines		
From West End Steam Line		
From Miscellaneous		
Total Gross Earnings		
<b>EXPENSES</b>		
<b>ELECTRIC LINES</b>		
Maintenance of Way and Buildings		
Maintenance of Equipment		
Transportation		
Power		
General Expense		
Total ( per cent)		
<b>HORSE LINES, Expenses</b>		
West End Steam Line ( per cent)		
Total Operating Expense ( per cent)		
Net Earnings		
<b>FIXED CHARGES</b>		
Interest on 5% Mortgage Bonds Acct'd.		
Interest on 6% Mortgage Bonds Acct'd.		
Sinking Fund		
Taxes Acct'd.		
Total Fixed Charges		
<b>DETERMINENTS</b>		
Total Deductions		
Net Surplus or Deficit		
<b>OTHER DEDUCTIONS</b>		
(Increase in Red)		

**New Orleans City and Lake Rail Road Co.**  
 Comparative Income Account for 189 and 189, also from December 1st, 189, to 189

**STATISTICS.**

DAILY RECEIPTS				TOTAL Miles		TOTAL Miles		CASH RECEIPTS AND DISBURSEMENTS		Amount
Date	189	189	189	189	189	189	189	189	189	189
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
Total										
Increase										
Decrease										

**ITS USE.**

We probably make a more extended use of our mileage than most roads, and therefore, every effort is made to insure correctness.

A statement is made weekly and monthly for the general manager, showing, among other things, the earnings per car mile of each line in the system, and the average total, from which he can see at a glance what lines are not up to the standard, and changes in schedules, effecting headway and running time, are suggested, to overcome the loss. The Monthly Earnings and Statistics Statement shows the earnings and operating expenses (in detail) per car mile, comparison being made with previous year.

The monthly statement of mileage of cars prepared by station foremen, is used in making up the record showing the life of wheels which are contracted for under a guaranteed mileage, of trolley wheels, motors, motor bearings, gears and pinions and other parts of the equipment, which record is made the test of the efficiency and economy of the particular kind or design used.

Our power is rented, and the basis of compensation is a rate per car-mile.

Our advertising contract is upon a basis of per car-day of so many miles.

Copies of some of the forms mentioned are attached hereto, for the information of those wishing to examine them

## REPORT ON STANDARD SYSTEM OF STREET RAILWAY ACCOUNTING.

The Committee on a Standard System of Street Railway Accounting, appointed near the close of your convention held in Niagara Falls, New York, October 19-22, 1897, for the purpose of further prosecuting the work of the former committee, has prepared a report covering classification of construction, equipment and operating expense accounts, forms of monthly and annual reports, and an alphabetical list of items chargeable to operating expense accounts. The report has been printed, and copies have been handed to the members present at this meeting.

This report should be considered in connection with the report submitted to the last annual convention of the Association, printed on pages 90-119 of its proceedings. (See REVIEW, November, 1897, pp. 768-774). The classification and forms recommended by the former committee, as the committee stated, were hastily prepared and unfinished, and the work of this committee has been mainly one of revision and suggested improvements of the recommendations of that preliminary report, in the light of the extended discussion of it at the Niagara Falls meeting, and of the subsequent experience of the members of the committee and of other members of the Association as gathered by correspondence.

On January 15, 1898, after the verbatim report of the Niagara Falls meeting had been for almost two months in the hands of members, and after the beginning of the fiscal year of most of them, Secretary Brockway sent a postal card to each member of the Association for the purpose of ascertaining how many had adopted the recommendations of the convention. To this postal card 39 replies were received. Nineteen companies stated that they had adopted, substantially, the classifications of accounts and forms of report, and found them practicable; and most of the other members who replied found little to criticize, and highly commended the general plan, although for various reasons they had not put it into practical use. It is interesting to note that they have been adopted also by the Street Railway Company of New South Wales, Australia.

Your committee feel that the fact that so considerable a proportion of the membership of the Association is using the Association's classifications and forms, imperfect as the former committee and the convention felt the first draft of them to be, is sufficient of itself to justify the formation of the Accountants' Association, and its continued existence until such time as the system of accounting, satisfactory in its general form and in most of its details to a majority of the street railway companies of the country, has been adopted, tried under a great variety of conditions, and approved in its main features by all. They are encouraged, too, by statements of members that the adoption of the new classifications does not interfere with the making of reports on forms previously used when required by the management of their companies or by state boards of railroad commissioners.

Some of the members, in their replies to Mr. Brockway's postal card, were good enough to make criticism of the work of the convention, and their objections and suggestions have been carefully considered by your committee.

On May 28, 1898, your committee sent to the members of the Association a letter supplementary to Mr. Brockway's postal card, and in part a repetition of it, asking them to assist the committee by sending to it answers to the following questions, and to have their replies in the hands of the committee on or before June 10:

1. Has your company adopted the standard system of accounts?
2. Has your company found the standard system practical and satisfactory?
3. Has your company found objections to the standard system? If so, please state them in detail.
4. What suggestions can you offer, or what criticisms can you make, to perfect the standard system?
5. On what date did your company put the standard system into operation?

6. On what date does the fiscal year of your company close?
7. Do the state officials of your state exercise any supervision over the books and accounts of your company?

8. If your company has not adopted the standard system, has the matter been considered at all?

To this letter the committee received replies from 26 companies—more than one-third of the membership. Only five of the replies, aside from those of the members of the committee, contained any criticisms or suggestions.

While the members of the committee were disappointed at receiving so few replies, they did not believe that the failure to reply indicated, in any case, a lack of interest in their work; neither did they assume that the failure to answer was an indication that the work of the previous committee was entirely satisfactory to the members who did not reply.

On July 4 your committee mailed a circular letter to the members of the Association for the purpose of ascertaining the practice of the membership as to charging to capital or construction to expense, or directly to income the cost of extensive renewals of track or equipment, and with reference to debiting income account with any sum, at stated intervals or otherwise, on account of depreciation, and it enclosed with the letter printed query blanks, on which it invited members to submit to the committee questions as to the proper account to which to charge or credit any item of expenditure or income as to which they might be in doubt. The responses to this circular were not numerous. The committee believes that it has answered, in its classification of accounts, all the queries propounded.

Your committee endeavored, by correspondence, to obtain a list of the states which require street railway companies to file reports of earnings and expenses, and to obtain copies of the blank forms on which these reports are made, and such blanks as it obtained it has turned over to the committee appointed to arrange the exhibit of blanks at the Boston convention.

The committee is indebted to the secretary of the Interstate Commerce Commission for copies of its form of annual report of railroads for 1897, and of each of the following pamphlets:

"Classification of Construction Expenses"; "Classification of Operating Expenses"; Bulletins Nos. 1, 2 and 3, containing decisions upon questions raised under the classification of operating expenses prescribed by the Commission.

Through correspondence with the secretary of the Interstate Commerce Commission, your committee learned of an Association of State Railroad Commissioners: that that association, at its ninth annual convention, in St. Louis, in 1897, appointed a committee to formulate a classification of construction and operating expenses of electric railways; that, at its tenth annual convention, in Washington, D. C., in May, 1898, the chairman of that committee, William O. Seymour, of Richfield, Conn., made the following report:

"The full committee have met, in connection with the Association of Railway Accounting Officers, and have prepared a classification of the operating and construction expenses of electric railways, and desire more time to submit the work which they have done to a committee composed of those who represent the American Street Railway Association, in order that, when this report is presented, it may be a report substantially approved by those who are experts in electrical railroad construction as well as the Railway Accounting Association, which more distinctly represents steam railroad construction. Hence, our report is not now in condition to be presented at this session, and we ask further time. We shall have it in preparation, and complete for presentation at the next meeting of the convention."

On receipt of this information, your committee wrote to Mr. Seymour, explaining to him the organization of the Street Railway Accountants' Association, the work that had been accomplished at the two meetings of the Accountants' Association, the work still in contemplation, and especially the scope of the work of the committee on Standard System of Street Railway Accounting, and sent to him a copy of our constitution and by-laws, a copy of the STREET RAILWAY REVIEW for April, 1897, containing a full report of the Cleveland meeting, and a copy of the printed verbatim report of our Niagara convention. The committee stated to Mr. Seymour that, if it had known of the



existence of the Association of State Railroad Commissioners, it would, if it had been agreeable to the Association, have attended its annual meetings in St. Louis and Washington; and it invited him and the other members of his committee to attend a meeting of your committee, to be held shortly in Cleveland or in New York.

Mr. Seymour replied as follows:

"Ridgefield, Conn., June 16, 1898.

"MR. C. N. DUFFY, Sec. and Treas., etc

"DEAR SIR.—Your kind favor, with accompanying documents, received. You represent just the parties with whom we wish to confer, but heretofore knew not whom to communicate with. At the annual convention of the Railroad Commissioners, in St. Louis, in 1897, the following persons were appointed a committee to prepare a proper classification of the construction and operating expenses of the street railway companies, similar, so far as applicable, to the classification of the same accounts of steam railroads, viz.:

"Wm. O. Seymour, Railroad Commissioner of Connecticut, Ridgefield.

"Ashley W. Cole, Albany, N. Y.

"R. S. Kayler, Columbus, Ohio.

"H. M. Kochersperger, President Railway Accounting Association, New Haven, Conn.

"M. Riebenach, Assistant Comptroller Pennsylvania Railroad, Philadelphia.

"H. D. Bulkley, Comptroller Baltimore & Ohio Railroad, Baltimore, Md.

"N. H. Heft, Chief of Electrical Department of New York, New Haven & Hartford Railroad, New Haven, Conn.

"The committee met in New York and have a report partially prepared, but before looking it over finally wish to confer with some experts in the electrical accounting so as to submit something likely to meet the approbation of all parties interested, which will be probably universally adopted, and thus secure uniform reports from all companies valuable for comparison. The street railways are becoming such valuable properties that investors and the public generally demand some such information for guidance. In the preparation of our work, we have relied greatly upon the aid and advice of the members of the Railway Accounting Association, named above, who are very able men in their line. Before saying definitely whether this committee can meet you at the time you name, I am going to communicate with them personally and inform you by mail later. I can and would be glad to meet you in New York City, but to make our conference most valuable, we should surely have the presence and co-operation of the gentlemen above referred to. Expect to hear from me soon.

"Yours very truly.

"(Signed) WM. O. SEYMOUR."

The committee are indebted also to E. S. Doud, of Hazelton, Pa., and Elmer M. White, of Hartford, Conn., for blank forms, and to E. D. Hibbs, of Jersey City, for printed lists of items chargeable to the various expense accounts kept by the companies. These have been sent to the committee in charge of the exhibition of blanks at the Boston convention.

The committee and the Association are under obligations to the STREET RAILWAY REVIEW and the "Street Railway Journal" for giving circulation beyond the membership of the Association to the circular letters of the committee, for valuable hints in their editorial columns, and for many words of encouragement. Both have done much to keep alive an interest in the Association and its objects.

Your committee wishes especially to thank Mr. Brockway, the secretary of the Association, for most valuable assistance in the matter of conducting the committee's correspondence, and in attending its meeting in New York.

Having obtained what data it could by correspondence, a meeting of your committee was called at the Oriental Hotel, Manhattan Beach, New York, on Monday, July 18th. This meeting was attended by Messrs. Duffy, Ham and Davies, of the committee, by W. B. Brockway, secretary of the Association, and by A. O. Kittridge, editor of "Accounties" and associate editor of the "Street Railway Journal."

The committee invited the secretary of the Interstate Commerce Commission, the members of the committee on accounts of the Association of State Railroad Commissioners, and the secretaries of several state Boards of Railroad Commissioners to meet with it in New York on July 20, and a number of them promised to attend. Much to their regret, however, and much more to the regret of your committee, they were unable to come. Every effort was made by correspondence and by personal solicitation of members, to interest in the work of the committee, representatives of every state which exercises any control over the books or accounting of street railway companies.

After a six days' session at Manhattan Beach, your committee separated, each member to take up at home a particular branch of the work. Finding it impossible to complete their report without another meeting, the members of the committee who attended the New York meeting met again in Cleveland on August 26 and 27.

The committee resolved to make no changes in the former classifications or forms, except for good and sufficient reasons, and the principal purpose of this statement is to present to the Association in detail the changes which have been recommended, and the considerations which influenced the committee in recommending them.

There can be no doubt that a scientific system of accounting is an effective check on the efficiency or inefficiency of the management of the street railway company, especially when a comparative study can be made of reports of other companies kept under exactly the same rules. For this purpose uniformity in accounting is as essential as accuracy. The committee have tried to adopt a classification comprising as small a number of accounts as will give to the management, with as much detail as necessary, the fullest information as to the receipts and expenditures of the company.

In the revised classifications the committee have made the explanations of what should enter into the various accounts as brief, clear and comprehensive as they could, and has supplemented the explanation of operating expense accounts with lists of the more important items chargeable to the respective accounts.

As the construction and equipment of a road must necessarily precede its operation, the committee has placed the classification of construction and equipment accounts ahead of the classification of operating expense accounts. To prevent confusion, it has designated the construction and equipment accounts by letter, and the operating expense accounts by number; and it has taken pains to make those construction and equipment and operating expense accounts which pertain to way and structures and to equipment consistent with each other, listing similar items under corresponding accounts.

Referring first to the construction and equipment accounts, the alterations which have been recommended in the titles and in the analyses or explanations of what should be included in each account, are as follows:

The account entitled, "Right of Way"—formerly No. 3, now Account C—as defined by the committee last year, included all expenditures in connection with securing or paying for right of way. The account was meant to include the cost of land acquired for right of way, as well as other right of way expenses, but as land was not mentioned, some might have been led to charge its cost under Account No. 6, "Real Estate Used in Operation of Road." To prevent any possible misunderstanding on this point, your committee have thought best to explain the account to include "all expenditures in connection with securing or paying for right of way, including cost of real estate for right of way."

The explanation of the account entitled "Track and Roadway Construction"—formerly Account No. 4, now Account D—is, in substance, the same as in last year's classification, but the committee have defined a little more explicitly the class of material and labor chargeable to it, and have endeavored to make it cover materials used on underground trolley and surface contact roads.

Account No. 5, "Electrical Track Construction," has been changed to Account E, "Electric Line Construction." As the

items chargeable to this account are no part of the track proper, but pertain only to the construction of the electric line, this is a better and more appropriate title. The committee have tried to make the account applicable to underground trolley, third rail and surface contact roads, as well as to overhead trolley roads. The punching or drilling of rails for track wiring was not specially mentioned last year, but it is now expressly stated to be chargeable to this account.

Account F (formerly No. 6), has been defined to include all expenditures for real estate used in the operation of the road except right of way.

Accounts 7 and 8 have been transposed, "Buildings and Fixtures Used in Operation of Road," (G) now preceding "Investment Real Estate" (H). The word "Fixtures" has been substituted for "Improvements," as more properly descriptive of the structures whose cost is intended to be covered by this title; and the term "building and fixtures" has been more particularly defined.

"Investment Real Estate and Improvements" has been changed to "Investment Real Estate" (H), the term "real estate," in its legal meaning, including both land and improvements.

"Power Plant Equipment" (Account I), has been explicitly defined to include the cost not only of the steam and electric equipment of the main power plant, but of sub-stations, and of water power machinery.

Account K, "Cars," is expressly limited to those cars from the operation of which revenue is derived. This is what is meant in the classification of 1897, and is evident from the explanation of expenditures chargeable to Account No. 13 ("Miscellaneous Equipment"), but the explanation of what was to be debited to "Cars" if read alone, must have been understood to refer to all cars.

Account No. 12, "Electrical Car Equipment," has been changed to Account L, "Electrical Equipment of Cars," and has been more clearly defined.

Freight, mail and express cars have been taken from "Miscellaneous Equipment" (Account No. 13, now Account M), and placed in Account K ("Cars"), and "Miscellaneous Equipment" is explained to refer only to cars used exclusively for the company's convenience, and not to cars used for the carriage of passengers or the hauling of baggage, freight, mail, express or other material for the public.

Account No. 14, now Account N ("Interest and Discount"), remains as before, except that it is specifically stated to include discounts or premiums resulting from the sale of bonds or other securities negotiated for construction purposes.

No construction accounts have been added to the former list; none has been taken from it.

Coming now to the revision of operating expense accounts, these were classified last year under four principal headings or divisions, namely, "A, Maintenance of Way and Structures"; "B, Maintenance of Equipment"; "C, Conducting Transportation"; "D, General Expenses." Your committee have reduced these headings to three—"Maintenance" (including "Maintenance of Way and Structure" and "Maintenance of Equipment"), "Transportation" (including "Operation of Power Plant" and "Car Service"), and "General." This is not, in any sense, a radical change, the headings remaining as they were before, except that the two maintenance headings ("Way and Structures" and "Equipment") are placed in one division, "Maintenance." This change was suggested by W. G. Ross, of Montreal, and the members of the committee who attended the New York meeting were unanimous in the opinion that it should be made. Under this heading are included all expenses of keeping up road and equipment. In other words, all maintenance expenses are classed under one general heading, as, in the report of 1897, all transportation expenses, although subdivided into "Operation of Power Plant" and "Car Service," were included under the one general heading "Transportation," this plan receiving the endorsement of the convention at Niagara Falls.

The order in which the three general headings should be arranged was carefully considered and debated by your committee. It had been suggested to the committee, in some of the replies to their circular letters, that the order of general headings recommended and adopted at Niagara was a departure from

the arrangement generally in use; that as transportation expenses on most roads exceed in amount the expenses of either of the other two divisions, "Transportation" should occupy first place in the classification, and should be followed by "Maintenance." The committee, however, were unanimous in thinking that as transportation expenses are subordinate and subsequent to maintenance expenses, and as transportation is necessarily dependent upon proper maintenance, the cost of maintenance should, in any classification of accounts, precede the cost of transportation. In this opinion as to the proper order of these two headings, the committee are backed by other accountants who have written to it upon the subject.

It was suggested in one of the letters to the committee that "General" should be the first subdivision, "because general expense embodies the salaries of the highest officials of the company, whose time and ability is devoted to everything pertaining to the company's business, whether it be maintenance, transportation expense or construction." The committee thought, however, that as "General Expenses" include items, such as salaries, printing and stationery, miscellaneous office expenses, and other miscellaneous expenses which, under a stricter auditing of vouchers than is practiced by any company with whose accounting any member of the committee was acquainted, might be divided between "Maintenance" and "Transportation," and as "General Expenses" cannot possibly, in logical or chronological order, precede "Maintenance" and "Transportation," "General" should be the last of the three main headings.

It may not be out of place to remark here that, in the form for reports of steam railroad companies prescribed by the Interstate Commerce Commission, the highest official authority accounting, the order of arrangement is "Maintenance," "Transportation," "General."

The total number of expense accounts in the classification adopted in 1897 was 38; the number recommended by your present committee is 39. The difference occurs in this way: Items chargeable under Account No. 8 in the former classification ("Renewals of Horse and Vehicle Equipment") are now chargeable to "Maintenance of Miscellaneous Equipment" (Account No. 8) and "Stable Expenses" (Account No. 30). Former Account No. 8 is thus abolished. Account No. 34 in the classification of 1897 ("Legal Expenses") has been divided into "Legal Expenses in Connection with Damages" (Account No. 34) and "Other Legal Expenses" (Account No. 35), for reasons stated in the discussion of this account at the Niagara meeting, and a new expense account, to include taxes, cost of car licenses, etc., has been added.

In all titles in which, in the classification of 1897, the phrase "repairs and renewals" was used, the single word "maintenance" has been recommended. In all titles in which the word "electrical" was used, the word "electric" has been substituted.

It is difficult sometimes to get a short ledger title which, standing alone, expresses all that is to be included under it. There are two rather indefinite and unsatisfactory titles in the classification of operating expense accounts—"Wages of *Other* Car-Service Employees," and "*Other* Legal Expenses." They immediately follow, however, accounts to which they are subordinate, and it is believed that no confusion can result from their use.

Taking up now the 39 accounts in their numerical order, the committee will state briefly the changes recommended and the reasons for them.

The word "construction" has been omitted from Account No. 1, first, to shorten the title, and, secondly, because some companies use the word "construction" to mean original cost or investment, rather than operating expense. This account thus becomes "Maintenance of Track and Roadway," instead of "Repairs and Renewals of Track and Roadway Construction."

For the same reasons, the phrase "track construction" has been dropped from Account No. 2, the word "line" being substituted, and the account becomes "Maintenance of Electric Line," instead of "Repairs and Renewals of Electrical Track Construction."

The title of Account No. 3 has been changed from "Repairs and Renewals of Buildings and Improvements" to "Maintenance of Buildings and Fixtures," because the word "improvements"



in street railway accounting has another meaning distinct from the sense in which it was used in the classification of operating expenses of 1897, namely, betterments, chargeable usually to some capital account, and it might be confusing to use the word in two senses in the same classification. Besides, the term "fixtures" more properly describes the structures or appurtenances, the cost of whose maintenance is meant to be included under this title.

It will be noticed that these three accounts, as in the classification of 1897, are placed under the main heading "Way and Structures" and in the same numerical order.

Accounts 4, 5 and 6, except as before noted, remain as they were in the classification of 1897.

Account No. 7 has been changed from "Repairs and Renewals of Electrical Car Equipment" to "Maintenance of Electrical Equipment for Cars." This may seem an unimportant change, but the former title might have been understood to include cars as well as the electric equipment of cars, and the new title more clearly and properly expresses what should be classed in the account.

Horses and horse vehicles play so small a part in the operation of a modern electric railway, that it seemed to the committee inadvisable to keep a separate account for the cost of their renewal, and former Accounts No. 8 ("Renewals of Horse and Vehicle Equipment") and No. 9 ("Repairs and Renewals of Miscellaneous Equipment") have been consolidated in new Account No. 8 ("Maintenance or Miscellaneous Equipment"), except that depreciation of horses and the cost of renewals of horses are now included in Account No. 30 ("Stable Expenses"). The cost of repairs and renewal of harness and vehicle equipment has been taken from former Account No. 31 ("General Stable Expenses") and put in this new Account No. 8, because being a maintenance expense, it should be classed in a maintenance account.

Former Account No. 10 ("Repairs and Renewals of Shop Tools and Machinery") now becomes No. 9 ("Miscellaneous Shop Expenses"). The change is in the title merely; the same things are listed under the new account as were charged to the old one. The new title is shorter, more generally used, better understood and more accurately descriptive of what should be included in the account, viz., not only the cost of repairs and renewals of shop machinery (engines, boilers, etc., used in repair shops), appliances (such as cranes and hoists), and tools (lathes, planers, drill-presses, etc.), but the expense of operating them, as, for example, the cost of coal and water for the shop engine, coke for smithing purposes, etc. As stated in the definition of this account, the cost of repairing or renewing hand-tools should not be charged to this account, unless used for repairing shop tools or machinery, but to the account most affected by their use. For example, repairs and renewals of picks and shovels used in track repair work, spike-mauls, ratchet-drills for drilling rails, and similar small tools should be debited to Account No. 1; a screw-driver used in repairing car bodies to Account No. 6; and it might be desirable similarly to apportion the cost of keeping up fixed tools and machinery; but it is impracticable to divide the cost of maintaining such machines among the various accounts for which their work is done, as, for instance, the work of a drill-press, used for many purposes—for example, for drilling rails for the benefit of Account No. 7, and side bars and other parts of trucks for Account No. 6.

As in last year's classification, there are six accounts under the sub-heading "Operation of Power Plant."

"Power Plant Wages and Superintendence" has been shortened to "Power Plant Wages," the definition of the account showing that it is meant to include superintendence.

The committee considered the recommendation of the Niagara Falls convention that Account No. 13, now No. 12, be made to read, "Water for Steam Power," but thought the better title to be "Water for Power," the account to include both water for steam plant and water for water-power plant.

The accounts under "Car Service" (Nos. 16 to 24) are the same in number, arrangements and definitions as in last year's classification, but some slight changes have been made in several of the titles.

"Car and Motor Supplies" has been changed to "Car Service Supplies" (Account No. 21), this being a better and more logical and consistent name. If "Car and Motor Supplies" were a popular title for this account, then "Maintenance of Motors" would be a proper title for Account No. 7 ("Maintenance of Electric Equipment of Cars"). But Account No. 7 was meant to include not only motors but controllers, trolley bases and poles, trolley wheels and forks, etc., and the wiring of car bodies for the purpose of conveying current from the line: so that the word "motors" did not seem to be sufficiently comprehensive, and the title "Electric Equipment of Cars" was adopted. For the same reasons, the word "motors" seemed to the committee too restricted a term to describe all the supplies for the electric equipment of cars intended to be included in this account, and the title "Car Service Supplies" was substituted.

"Miscellaneous Transportation Expenses" has been changed to "Miscellaneous Car Service Expenses," for the reason that there are two sub-headings under the main title "Transportation" (namely, "Operation of Power Plant" and "Car Service"), and miscellaneous transportation expenses might be construed to include expenses both of power plant and of car service. Inasmuch as an account (No. 14) has been provided for the miscellaneous expenses of the power plant, and another account for the miscellaneous expenses incident to car service, they should have distinctive titles. One should not be given a title that might cover items chargeable to the other.

"Cleaning, Watering and Sanding Track" has been changed to "Cleaning and Sanding Track" (Account No. 23)—a shorter title and just as expressive of what is to be embraced in the account.

We come now to the third main division—"General"—and the 15 accounts listed under it. This general heading has no sub-headings. The question as to whether or not sub-headings, "Current," to embrace Accounts 25 to 35, inclusive, and "Fixed," to embrace Accounts 36 to 39, should be provided, was fully considered by the committee, and it was decided not to use them, because, principally, of the danger of misunderstanding or misapplying the term "fixed," which is generally applied to interest charges only.

The number of "General" accounts has been increased from 13 to 15, because of the division of former Account 34 ("Legal Expenses") into the present Accounts Nos. 34 and 35 ("Legal Expenses in Connection with Damages" and "Other Legal Expenses"), and the addition of Account 39 ("Taxes").

The titles of some of the "General" accounts have been changed. "General Stores Expenses" is now "Storeroom Expenses" (No. 29); "General Stable Expenses" is now "Stable Expenses" (No. 30); "Advertising and Expense of Park Properties" is now "Advertising and Attractions" (No. 31); "Injuries and Damages" is now "Damages" (No. 33); a division has been made of "Legal Expenses," following the recommendations of the Niagara Falls convention, into "Legal Expenses in Connection with Damages" (No. 34), and "Other Legal Expenses" (No. 35); "Track Rentals" is now "Rent of Tracks and Terminals" (No. 37), and "Rental of Land and Buildings" is now "Rent of Land and Buildings" (No. 36). The numerical order of the accounts is not changed, except as to Nos. 36 and 37, which have been transposed, it being the judgment of the committee that this order was preferable to the old order.

The title "General Stores Expenses" was changed to "Storeroom Expenses," and the title "General Stable Expenses" to "Stable Expenses," because all accounts under this main heading are general, and it is unnecessary to repeat the word in their titles.

"Advertising and Expenses of Park Properties" was changed to "Advertising and Attractions" because the latter title is shorter and more accurately descriptive of the expenses which should be debited to the account. All expenses incurred for the purpose of attracting and inducing travel, such as maintenance of parks, or donations or contributions to parks, theaters, circuses or other amusements, while not perhaps strictly advertising, are analogous to advertising, and may properly be included with advertising expenses in one account.

"Track Rentals" has been changed to "Rent of Tracks and

Terminals"—a broader title, and one that will better take care of the expenses chargeable to the account. Some companies, notably suburban companies connecting with city lines, are obliged to rent a piece of track, or possibly a piece of ground, for a terminal station or stopping place, and the expense of this should be charged to "Rent of Track and Terminals," as the rent of offices in an office building not owned by the company should be charged to Account No. 36. The word "terminals" in this account (No. 37) is not meant to refer to depots, car-houses or other buildings. This account should not be confounded with "Rentals of Leased Lines," which the committee consider not an operating account, but a deduction from income.

A new operating expense account (No. 39) to include taxes, cost of car licenses, etc., has been added, the committee being unanimously of the opinion that taxes, being incident to the ownership of property and the operation of the road, are an operating expense. In the report of the former committee, it was recommended that taxes should not be considered as an operating expense, but should be classed as a deduction from income, together with interest on funded and floating debt, and rentals of leased lines. The disposition of taxes was a subject of careful thought and deliberation by the former committee, and in reaching the decision that they did, they were largely influenced by the fact that nearly all Boards of Railroad Commissioners required that taxes be treated in this way. There seems to be no logical reason why taxes should *not* be treated as an operating expense. They are a necessary burden in the operation of every railroad. No company escapes them. They are analogous to insurance, rent of tracks and terminals, and rent of land and buildings. If a company rents the real estate it uses in the operation of its road, its rent of land and buildings account will be larger and its taxes account correspondingly smaller than they would be if it owned the real estate. If rentals, therefore, are to be treated as an operating expense, taxes should be treated in the same way.

In addition to the fact that taxes seem logically to be an operating expense, much confusion will be avoided by so classifying them. At the present time, although it has come to be the general practice to charge taxes in operating expenses, yet when a statement is made of the cost of operating a road, it is not certainly known whether taxes are included or not, some companies considering them as a fixed charge. Taxes being included in operating expenses, the stockholders of a company, when they are informed of the amount of the company's gross receipts and operating expenses, know what the difference, if any, is the amount applicable to interest on capital invested in the property, whether that capital be represented by bonds, bills or accounts payable, preferred stock, or common stock, or applicable, if the stockholders so elect, to the purchase or construction of extensions, additions, or betterments.

The committee considered a suggestion that interest should also be included in operating expenses, but in line with the substantially universal practice, concluded to leave it as a fixed charge to be deducted from income.

Rent of leased lines is also to be deducted from income, separately from expense, this charge being regarded by the committee as similar to interest and dividends, it being, under some leases, in the nature of a guaranteed dividend on the stock of the line leased. A distinction should be made between the leasing of a line of railroad under an agreement by which the lessee operates and the leased lines and the renting of a part of the track of another operating company, which is clearly chargeable to Operating Expenses.

A few words as to some changes that are recommended in the classification of items chargeable to "General" accounts may be appropriate.

The salary of general counsel or solicitor is to be charged to Accounts Nos. 34 and 35, and not to account No. 25. In this ruling the committee followed what seemed to be the consensus of opinion at the Niagara Falls meeting.

Account No. 27 ("Printing and Stationery") has been made to include coin-bags, money-wrappers and money-tags. These items are as properly printing and stationery as any items that can be so classed, and have been taken out of "Miscellaneous Office Expenses", where they were placed last year, the committee being

fully agreed that this was an error. In every other respect "Printing and Stationery" conforms to the recommendations of the Niagara convention. The committee have not failed to consider the items of printing or engraving of tickets or transfers, the printing of briefs and other legal papers, and of signs, posters, etc., but believe that these things were properly placed last year. These items are so clearly separable from general printing and stationery that no confusion can arise from this classification. Printed tickets are as clearly a part of transportation expenses as metal or celluloid tickets, which would hardly be charged by anyone to "Printing and Stationery." Of course some roads have such expenses. "Printing and Stationery" is generally understood to include printing and supplies intimately connected with accounting, corresponding, etc., although some printing and stationery, as, for example, time-books and pay envelopes, may be used in every department of the roads. Time-books, used to record the time of men working on the track, for instance, are a part of the "General Expense" of the company, because they pertain to accounting. Tickets are no part of accounting; but printed blanks for reports of conductors, being used for accounting should be charged to "Printing and Stationery."

Account No. 30 ("Stable Expenses") has been changed in this respect; that the ordinary repairs of harness and vehicle equipment formerly classified under the heading are now assigned to Account No. 8; and depreciation and renewal of horses, formerly chargeable to old Account No. 8, are now to be charged here. The committee carefully considered the suggestion of some of the members of the Association that this account ("Stable Expenses") should be divided and apportioned to the work that horses do; but it is the judgment of the committee that such a change should not be made—first, because of the labor and expense that would be involved in ascertaining the proper apportionment, and, secondly, because if this were done, the aggregate of "Stable Expenses" might be lost sight of. The committee suggests that any one desiring to do so may make such an apportionment or subdivision, if the value and importance of the information sought justifies it, and still carry all other stable expenses in Account No. 30. Of course if there are stable expenses in connection with construction work—extensions of track, or otherwise—construction accounts should be debited with the amount of them.

"Injuries and Damages" seemed a tautological title, and has been shortened to "Damages." This change was recommended by the last convention.

Under headings Nos. 34 and 35 the committee have attempted to define "legal expenses", and following the suggestions made at the Niagara convention, to distinguish between legal expenses connected with the investigation, adjustment and trial of damage claims and cases and other legal expenses.

Part of the work assigned to the Committee on a Standard System of Street Railway Accounting was the preparation of a form of annual report for street railway companies. The committee have included in their reports forms for both annual and monthly reports. They differ in several respects from the form of annual report submitted last year. In the first place, columns are not provided for comparison with previous corresponding periods; the forms are for the current month or year only. They can easily be made to cover two or more months or years, and comparisons are desirable wherever possible, but they are no necessary part of such an annual report as the committee was asked to suggest.

Instead of providing a single column for all figures, a column for the totals of the several subdivisions has been provided, to facilitate addition and subtraction.

"Track Rentals" has been changed to "Rent of Tracks and Terminals," and this source of income follows, instead of preceding, "Rent of Land and Buildings," to make the reports conform to the change made in the titles of Operating Expense Accounts Nos. 36 and 37.

Taxes have been omitted from deductions from income, because, for reasons before stated, they are now regarded as an operating expense.

Lines have been provided for the totals of Income from Other Sources, Deductions from Income, and Deductions from Net Income.



Provision has been made for showing interest on real estate mortgages separately from interest on funded and floating debt, and for showing miscellaneous deductions from income.

The surplus to be carried forward in the annual report is the surplus shown by the balance sheet at the close of the current fiscal year, and not necessarily on December 31, as indicated in the form presented last year. This change has been made because the fiscal year of some companies does not end with the calendar year.

There is an alphabetical list of items chargeable to operating expense accounts. This list, of course, is not, and probably never will be, complete; but it is believed that some who are charged with the duty of street railway accounting will find it useful.

Since coming to Boston the committee have met Mr. Wm. O. Seymour, chairman, and Mr. H. F. Billings, secretary, of the State Board of Railroad Commissions of Connecticut, and Col. N. H. Heft, chief of the electrical department of the N. Y., N. H. & H. R. R. Co.—all members of a committee on uniform system of electric railway accounting appointed by the National Association of Railroad Commissioners, and have invited them and any others whom they may wish to bring with them, to attend the sessions of the Street Railway Accountants' convention, and to participate in the discussion of this committee's report.

Every member of your committee knows that the task of standardizing the classifications of street railway accounts is far from finished, but this report is submitted as a step toward a standard system, and the committee hope for, and earnestly invite the freest criticism and fullest discussion possible in the short time assigned for its consideration. Respectfully

C. N. DUFFY,  
Wm. F. HAM,  
J. F. CALDERWOOD,  
H. L. WILSON,  
H. J. DAVIES.

## CLASSIFICATION OF CONSTRUCTION AND EQUIPMENT ACCOUNTS.

In the following classification "Labor" should be understood to mean not only the manual work of laborers, but also superintendence, supervision, clerical work, engineering and inspection, so far as they are chargeable to the account referred to.

"Material" should be understood to mean not only finished or unfinished products, appliances or parts, but such smaller articles as are usually termed "supplies."

"Tools" should be understood to mean hand-tools of mechanics, and other tools, used in the work chargeable to the account referred to.

"Expenses" should be understood to mean all expenses chargeable to the account referred to that are not labor, material or tools.

### CONSTRUCTION AND EQUIPMENT ACCOUNTS.

- A. Organization.
- B. Engineering and Superintendence.
- C. Right of Way.
- D. Track and Roadway Construction.
- E. Electric Line Construction.
- F. Real Estate Used in Operation of Road.
- G. Buildings and Fixtures Used in Operation of Road.
- H. Investment Real Estate.
- I. Power Plant Equipment.
- J. Shop Tools and Machinery.
- K. Cars.
- L. Electric Equipment of Cars.
- M. Miscellaneous Equipment.
- N. Interest and Discount.
- O. Miscellaneous.

#### A. ORGANIZATION.

Charge to this account all expenses incurred in effecting organization, including legal expenses.

#### B. ENGINEERING AND SUPERINTENDENCE.

Charge to this account all expenditures for services of engi-

neers, draftsmen and superintendents employed on preliminary and construction work, and all expenses incident to the work.

#### C. RIGHT OF WAY.

Charge to this account all expenditures in connection with securing or paying for right-of-way, including cost of real estate for right-of-way.

#### D. TRACK AND ROADWAY CONSTRUCTION.

Charge to this account all expenditures for track and roadway construction, including labor, material, tools, freight, hauling, distribution of material, and all other expenses incident to the work; cost of grading, excavating, track laying, ties, yokes, slot-rails, manhole frames and covers, rails, rail fastenings, welded joints, special work (such as crossings, cross-overs, curves, frogs, guard-rails, run-offs, switches, switch-mates, turn-outs), ballasting, paving, fences (right of way), bridges and culverts, trestles, subways and tunnels.

The cost of tracks in yards, terminals, car-houses or other buildings, should be charged to this account.

The cost of punching and drilling rails for track wiring should be charged to account E.

#### E. ELECTRIC LINE CONSTRUCTION.

Charge to this account all expenditures for overhead, underground, third-rail, or surface-contact electric line construction, including labor, material, tools, freight, hauling, distribution of material, and all other expenses incident to the work.

Cost of punching and drilling rails for track-wiring, rail-bonds, poles (iron or wood), labor and material for setting and painting poles; feed-wire, guard-wire, span-wire, strain-wire, supplementary-wire, trolley-wire, ground-feeders, underground-feeders, pole fixtures, hangers or suspensions, insulators (overhead), lightning arresters and appliances, signals and signaling apparatus, overhead crossings and switches, ground terminals, and all labor in connection with putting same in position; conduits and conduit appliances for underground trolley construction, including conductors, insulators, sewer connections, sewer traps and underground feeders; third rails, and insulators for third-rail construction; surface-contact appliances for surface-contact roads, including magnets, contact-boxes, manhole-frames and covers.

#### F. REAL ESTATE USED IN OPERATION OF ROAD.

Charge to this account all expenditures for real estate used in operation of road, except real estate used for right of way charged in account C.

#### G. BUILDINGS AND FIXTURES USED IN OPERATION OF ROAD.

Charge to this account all expenditures for buildings and fixtures used in operation of road, including labor, material, tools, freight, hauling of material, and all other expenses incident to the work.

The term "Buildings and Fixtures" includes power house, car houses, shops, office buildings (when owned by the company), waiting rooms, sheds, out-houses, coal bins, sand houses, stables, store houses, switch tenders' houses, fences (except park and right of way), docks, wharves, and all other buildings and enclosures, and their stationary fixtures, including pipes for gas, water, sewage and drainage, apparatus for heating, lighting and ventilating, sidewalks and paving in streets in front of and adjacent to the company's buildings (except in tracks), and inspection and repair pits in car houses, shops or other buildings.

The cost of tracks in yards, terminals, car-houses and other buildings should be charged to account D.

The cost of electric line in yards, terminals, car-houses and other buildings should be charged to account E.

#### H. INVESTMENT REAL ESTATE.

Charge to this account all expenditures for land and buildings not used in operation of road.

#### I. POWER PLANT EQUIPMENT.

Charge to this account all expenditures for steam and electric equipment of power plant, including foundations and installations.

The equipment of sub-stations (if used) should be charged to this account.

All expenditures for water-power machinery (if used) should be charged to this account.

The cost of buildings used for main power houses or sub-stations should be charged to account G.

**J. SHOP TOOLS AND MACHINERY.**

Charge to this account all expenditures for shop tools and machinery for general repair shops, car-houses, etc., including foundations and installation.

**K. CARS.**

Charge to this account all expenditures for passenger, baggage, express, freight, mail and other cars from the operation of which revenue is derived.

The term "Cars" includes car-bodies and trucks, and all fixtures or appliances inside of or attached to the car-body or truck (except the electric equipment of the car).

**L. ELECTRIC EQUIPMENT OF CARS.**

Charge to this account all expenditures for electric equipment and wiring of all cars, whether revenue cars or work cars, including labor, material, tools, freight, hauling of material, and all other expenses incident to the work.

**M. MISCELLANEOUS EQUIPMENT.**

Charge to this account all expenditures for water cars, sprinkling cars, sand cars, salt cars, supply cars, and other work cars; snow-plows, sweepers, scrapers, and miscellaneous snow equipment; horses, harness, wagons and vehicles; tools and appliances necessary in the use of work cars or snow equipment.

**N. INTEREST AND DISCOUNT.**

All interest paid or received in connection with funds for construction, and all discounts or premiums resulting from the negotiation of securities for construction, should be charged or credited to this account.

**O. MISCELLANEOUS.**

Charge to this account all expenditures for printing and stationery, office supplies and expenses, damage claims, wages of clerks, and all other expenses incident to construction not otherwise provided for.

### CLASSIFICATION OF OPERATING EXPENSE ACCOUNTS.

In the following classification, "Labor" should be understood to mean, not only the manual work of laborers, but also superintendence, supervision, clerical work, engineering and inspection, so far as they are chargeable to the account referred to.

"Material" should be understood to mean, not only finished or unfinished products, appliances or parts, but such smaller articles as are usually termed "supplies."

"Tools" should be understood to mean hand-tools of mechanics, and other tools used in the work chargeable to the account referred to. These tools should not be confounded with the tools used in shop, for which a separate account (No. 9) is provided.

"Expenses" should be understood to mean all expenses chargeable to the account referred to that are not labor, material or tools.

The cost of replacement, renewal or repair of property destroyed or injured by fire, worn out, or otherwise unfitted for use, should be charged to the appropriate maintenance account, which should be credited with the amount received for insurance or realized from the sale of the property so unfitted for use. But if the property substituted is of greater value than the original property, the excess should be charged to the capital or construction account to which the original property was charged, if of less value, the difference between the value of the property as repaired, renewed or replaced and its original cost or value should be credited to the capital or construction account to which the first cost was charged. So proceeds from the sale of scrap material should be credited to the account to which the cost of replacement of that material is charged, or, if not replaced, to the original cost account.

The cost of experiments should be charged in operating expenses to the account most affected.

In making up monthly reports charge to accounts Nos. 36, 37, 38 and 39, respectively, the month's proportion of the total annual charge for rent of land and buildings used in the operation of the road, rent of tracks and terminals, insurance and taxes, as nearly as the same can be ascertained, and not the amount which may have been actually paid in the month.

**Operating Expense Accounts.****MAINTENANCE.****WAY AND STRUCTURES.**

1. Maintenance of Track and Roadway.
2. Maintenance of Electric Line.
3. Maintenance of Buildings and Fixtures.

**EQUIPMENT.**

4. Maintenance of Steam Plant.
5. Maintenance of Electric Plant.
6. Maintenance of Cars.
7. Maintenance of Electric Equipment of Cars.
8. Maintenance of Miscellaneous Equipment.
9. Miscellaneous Shop Expenses.

**TRANSPORTATION.****OPERATION OF POWER PLANT.**

10. Power Plant Wages.
11. Fuel for Power.
12. Water for Power.
13. Lubricants and Waste for Power Plant.
14. Miscellaneous Supplies and Expenses of Power Plant.
15. Hired Power.

**CAR SERVICE.**

16. Superintendence of Transportation.
17. Wages of Conductors.
18. Wages of Motormen.
19. Wages of Other Car Service Employes.
20. Wages of Car House Employes.
21. Car Service Supplies.
22. Miscellaneous Car Service Expenses.
23. Cleaning and Sanding Track.
24. Removal of Snow and Ice.

**GENERAL.**

25. Salaries of General Officers.
26. Salaries of Clerks.
27. Printing and Stationery.
28. Miscellaneous Office Expenses.
29. Store-Room Expenses.
30. Stable Expenses.
31. Advertising and Attractions.
32. Miscellaneous General Expenses.
33. Damages.
34. Legal Expenses in Connection with Damages.
35. Other Legal Expenses.
36. Rent of Land and Buildings.
37. Rent of Tracks and Terminals.
38. Insurance.
39. Taxes.

**Maintenance.****WAY AND STRUCTURES****1. MAINTENANCE OF TRACK AND ROADWAY.**

Charge to this account all expenditures for repairs and renewals of track and roadway, of culverts and subways, of tracks in yards, terminals, car houses or other buildings, including labor, material, tools, fuel, light, water, ice, freight, hauling and distribution of material, and all other expenses incident to the work.

The cost of taking up track, whether new track is laid in its place or not, should be charged to this account.

The cost of punching and drilling rails for repairs or renewals of track-wiring, and of removing and relaying pavement, ballast, etc., when necessary for repairs or renewals of the electric line, should be charged to account No. 2.

The feed and keep of horses used in connection with this work should be charged to account No. 30.

The cost of repairs and renewals of harness and wagons used in connection with this work should be charged to account No. 8.

Following is a list of some of the items chargeable to this account:

Ballast.	Lumber.
Bolts.	Manhole covers for underground trolley.
Braces, rail.	Manhole frames for underground trolley.
Brick.	
Bridges.	



Cement.	Molds for welded joints.
Chairs for rails.	Nails.
Chinders for ballast.	Nuts.
Coal for welding joints.	Nut-locks.
Clamps for welded joints.	Paving materials.
Crossings.	Pig-iron for welded joints.
Cross-overs.	Pipes, drain.
Culverts.	Rails.
Curves.	Run-offs.
Drains.	Sand.
Fences, right-of-way.	Screws.
Fish-plates.	Slot-rails for underground trolley.
Freight.	Spikes.
Frogs.	Steel.
Fuel.	Stone.
Guard-rails.	Subways.
Gravel.	Switches.
Hauling.	Switch mates.
Ice for ice water.	Ties.
Iron.	Tie-plates.
Joints, welded.	Tie-rods.
Joints, not welded.	Tools.
Labor.	Trestles.
Light (lanterns and fixtures, oil, lamp-wick, torches, candles, incandescent lamps and fixtures, arc lights and fixtures, globes and carbons).	Turn-outs.
	Washers.
	Water.
	Yokes for underground trolley.

## 2. MAINTENANCE OF ELECTRIC LINE.

Charge to this account all expenditures for repairs and renewals of overhead, underground, third-rail, or surface-contact electric line, including labor, material and tools employed or used in taking up, resetting and painting or repainting poles, taking down trolley, feed, guard and supplementary wires and substituting new, repairing and renewing conduits for wires, repairing and renewing bond-wires, punching and drilling rails for track-wiring, removing and relaying pavement, ballast, etc., when necessary for repairs or renewals of the electric line, freight, hauling and distribution of material, fuel, light, water and ice, and all other expenses incident to the work.

The cost of repairs and renewals of electric line in yards, terminals, car houses or other buildings should be charged to this account.

The feed and keep of horses used in connection with this work should be charged to account No. 30.

The cost of repairs and renewals of harness and wagons used in connection with this work should be charged to account No. 8.

Following is a list of some of the items chargeable to this account:

Bolts.	Magnets for surface contact roads.
Boxes for lightning arresters.	Mandrel frames for surface contact roads.
Cement.	Nuts.
Charcoal.	Painting material for poles.
Clamps for poles.	Pins, iron, for cross-arms.
Conductors for underground trolley.	Pins, wood, for cross-arms.
Conduits.	Poles, iron.
Contacts for surface contact roads.	Poles, wood.
Contract boxes for surface contact roads.	Pole-tops for iron poles.
Cord.	Rail-bonds.
Cross-arms, iron.	Screws.
Cross-arms, wood.	Sewer connections for underground trolley.
Crossings.	Sewer traps for underground trolley.
Feeders, ground.	Signals and signaling apparatus.
Feeders, overhead.	Solder.
Feeders, underground.	Soldering salts.
Freight.	Steel.
Fuel.	Stone.
Gasoline.	Suspensions.
Hangers.	Sand.
Hauling.	Switches.
Ice for ice water.	Tape, insulating.
Insulators, overhead.	Terminals.
Insulators, underground.	Third rails.
Insulators, for third rail.	Tools.
Iron.	Washers.
Labor.	Water.
Light (lanterns and fixtures, oil, lamp-wick, torches, candles, incandescent lamps and fixtures, arc lights and fixtures, globes and carbons).	Wire, feed.
Lightning arresters and parts.	Wire, guard.
Mandrel covers for surface contact roads.	Wire, span.
	Wire, strain.
	Wire, supplementary.
	Wire, trolley.

## 3. MAINTENANCE OF BUILDINGS AND FIXTURES.

Charge to this account all expenditures for repairs and renew-

als of buildings and fixtures used in the operation of the road, including labor, material, tools, freight, hauling of material, and all other expenses incident to the work.

The term "Buildings and Fixtures" includes power houses, car houses, shops, office buildings (when owned by the company), waiting-rooms, sheds, out-houses, coal-bins, sand-houses, stables, store houses, switch-tenders' houses, fences (except park and right of way fences), docks, wharves and all other buildings and enclosures, and their stationary fixtures, including pipes for gas, water, sewage and drainage, apparatus for heating, lighting and ventilating, sidewalks and pavements in front of and adjacent to the company's buildings (except in tracks), and inspection and repair pits in car houses, shops or other buildings.

The cost of repairs and renewals of tracks in yards, terminals, car houses or other buildings should be charged to account No. 1.

The cost of repairs and renewals of electric line in yards, terminals, car houses or other buildings should be charged to account No. 2.

Following is a list of some of the items chargeable to this account:

Awnings.	Pipes, drain.
Bolts.	Pipes, gas.
Bolt ends.	Pipes, sewer.
Brick.	Pipes, water.
Builders' hardware.	Pits in car-houses and shops.
Building material.	Plumbing.
Building permits.	Rivets.
Cement.	Roofing material.
Cisterns.	Sand.
Drains.	Sash cord.
Excavations.	Sash weights.
Fences (except park and right-of-way).	Scales, platform.
Foundations.	Screws.
Freight.	Sewerling.
Grading.	Shelving and other fixtures.
Hauling.	Shingles.
Heating apparatus and fixtures.	Side-walks.
I-beams.	Slate.
Iron.	Spikes.
Labor.	Steel.
Laths.	Stone.
Lighting apparatus and fixtures.	Tools.
Lime.	Tile.
Lumber.	Turn-buckles.
Nails.	Ventilating apparatus and fixtures.
Nuts.	Washers.
Painting materials (oil, turpentine, varnish, lead, painters' supplies).	Water.
Paving in streets (except in connection with tracks).	Water connections.
Plaster.	Water meters.
	Wells.
	Wire.

## EQUIPMENT

### 4. MAINTENANCE OF STEAM PLANT.

Charge to this account all expenditures for labor, material, tools, freight, hauling of material and all other expenses incident to repairs and renewals of steam plant or water power plant, including engines and engine parts, appliances and fixtures, belts, belt tighteners and fixtures, receivers, lubricators and oiling devices; shafting, clutches, cranes, hoists and other engine-room appliances; boilers, boiler fittings and appliances; furnaces, economizers, stacks, mechanical-draft machinery, pumps, feedwater heaters, purifiers, tanks, condensers, coal and ash-conveying machinery, mechanical stokers and other boiler-room appliances; piping and steam fitting, including valves, separators, water and sewer connections and water meters.

Following is a list of some of the items chargeable to this account:

Ash-conveying machinery.	Hoists.
Belts.	Injectors.
Belt fixtures.	Iron.
Belt tighteners.	Labor.
Boilers.	Lubricators.
Boiler appliances.	Oiling devices.
Boiler fittings.	Piping.
Bolts.	Pipe covering.
Cement.	Pipe fittings.
Clutches.	Pulleys.
Coal-conveying machinery.	Pumps.
Condensers.	Purifiers.

Cranes.	Receivers.
Draft machinery.	Screws.
Economizers.	Separators.
Engines.	Sewer connections
Engine appliances	Shafting.
Engine fixtures.	Stacks.
Engine parts.	Steam fittings.
Fire brick.	Steel.
Fire clay	Stokers, mechanical.
Freight.	Tanks.
Furnaces.	Tools.
Grate bars.	Water connections.
Hauling.	Water meters.
Heaters, feedwater.	Water power machinery.

#### 5. MAINTENANCE OF ELECTRIC PLANT.

Charge to this account all expenditures for labor, material, tools, freight, hauling of material and all other expenses incident to repairs and renewals of electric plant, including generators and generator parts, switchboards, cables and feeder terminals and wiring in connection with same, storage batteries, transformers, boosters, rheostats, circuit-breakers, ammeters and other electric equipment.

Commutator-brushes for generators should be charged to account No. 14.

Following is a list of some of the items chargeable to this account:

Ammeters.	Labor
Boosters.	Lightning arresters and parts.
Cables.	Rheostats.
Circuit breakers.	Storage batteries.
Feeder terminals.	Switchboards.
Freight.	Switches.
Generators.	Tools.
Generator parts	Transformers.
Hauling.	

#### 6. MAINTENANCE OF CARS

Charge to this account all expenditures for repairs and renewals of passenger, baggage, express, freight, mail and other cars from the operation of which revenue is derived, including labor, material, tools, freight, hauling of material, and all other expenses incident to the work.

The term "cars" includes car-bodies and trucks and all fixtures or appliances inside of or attached to the car-body or truck, except the electric equipment of the car.

The cost of cars purchased to keep good the original number of cars should be charged to this account

Bell and register cord, trolley rope, incandescent lamps, commutator-brushes and other supplies for cars should be charged to account No. 21.

Following is a list of some of the items chargeable to this account:

Axles.	Labor.
Bells.	Life guards.
Bell cord fixtures.	Lumber.
Bolts.	Mirrors.
Brakes (hand or power).	Nails.
Brake appliances (hand or power).	Nuts.
Brake shoes.	Oil boxes.
Brasses.	Painting material.
Brass fixtures.	Pedestals.
Brass trimmings.	Pilots.
Bumpers.	Sand boxes, attached to cars.
Canvas.	Screws.
Cotters.	Seats.
Curtains.	Seat covering
Curtain fixtures.	Seat fixtures.
Dashes and parts.	Signs.
Draw bars.	Sign fixtures.
Electric heaters	Snow scrapers, attached to cars.
Electroliers.	Springs.
Fare registers.	Steel.
Fenders and parts.	Steps.
Floor mats.	Stoves
Freight.	Stove fixtures.
Gates.	Tools.
Glass.	Trucks.
Gongs.	Truck frames and parts.
Grab handles.	Washers.
Hauling.	Wood-work.
Headlights and parts.	Wheels.
Iron.	

#### 7. MAINTENANCE OF ELECTRIC EQUIPMENT OF CARS.

Charge to this account all expenditures for repairs and renewals of the electric equipment and wiring of cars, whether revenue

cars or work cars, including labor, material, tools, freight, hauling of material, and other expenses incident to the work.

The cost of shifting electric equipments from summer to winter cars, or vice versa, should be charged to this account.

The cost of equipments purchased to keep good the original number of equipments should be charged to this account.

The cost of commutator-brushes, incandescent lamps, oil and other supplies for the electric equipment of cars should be charged to account No. 21

Following is a list of some of the items chargeable to this account:

Armatures and parts.	Labor.
Bearings.	Light circuits.
Bolts.	Lighting arresters and parts.
Brasses—armature, axle, gear—case.	Motor frames.
Brush-holders and parts.	Nuts.
Canvas.	Pinions.
Circuits for heat, light, power.	Plows, for underground trolley cars.
Circuit breakers, automatic.	Power circuits.
Commutators and parts.	Rheostats.
Contact shoes for surface contact cars.	Screws.
Contact shoes for third-rail cars.	Shafts.
Controllers and parts.	Springs.
Cotters.	Steel.
Cut-out boxes and parts.	Storage batteries, for storage battery cars.
Fields and parts.	Tape.
Frames for motors.	Terminals.
Freight.	Tools.
Gears.	Trolley bases.
Gear cases and parts.	Trolley forks.
Hauling.	Trolley poles.
Heat circuits.	Trolley wheels and parts.
Insulating material.	Washers.
Iron.	Wiring.

#### 8. MAINTENANCE OF MISCELLANEOUS EQUIPMENT.

Charge to this account all expenditures for repairs and renewals of water-cars, sprinkling-cars, sand-cars, salt-cars, supply-cars, or other work cars, snow-plows, sweepers, scrapers, miscellaneous snow equipment, wagons and all other vehicles not operated for the purpose of revenue, including labor, material, tools, freight, hauling of material, and all other expenses incident to the work.

Repairs and renewals of all harness should be charged to this account.

Repairs and renewals of the electric equipment of all work-cars, snow-plows, sweepers, etc., should be charged to account No. 7.

Following is a list of some of the items chargeable to this account:

Axles.	Life guards.
Bolts.	Lumber.
Brakes, hand or power.	Nails.
Brake appliances, hand or power.	Nuts.
Brake shoes.	Oil boxes.
Brasses.	Painting material.
Brass fixtures.	Pedestals.
Bumpers.	Pilots.
Canvas.	Rattan for sweepers.
Cotters.	Sand boxes, attached to work cars.
Dashes and parts.	Screws.
Draw bars.	Snow scrapers, attached to work cars.
Electroliers.	Springs.
Fenders and parts.	Steel.
Freight.	Tools.
Glass.	Trucks.
Gongs.	Truck frames and parts.
Grab handles.	Washers.
Hauling.	Wheels.
Headlights and parts.	Wood-work.
Iron.	
Labor.	

#### 9. MISCELLANEOUS SHOP EXPENSES.

Charge to this account all expenditures for repairs and renewals of shop tools, machinery and appliances, such as engines, boilers, shafting, motors, etc., used in general repair work, including labor, tools, coal, coke, lubricants, waste and other material, freight, hauling of material, fuel, light, water and ice, wages of master mechanic, shop foreman, engineers, firemen and other employees engaged in operating shop engine, and all other expenses incident to the general repair shops.

Hand-tools of mechanics or laborers used exclusively in connection with work chargeable to accounts Nos. 1 to 8, 14, 21 and 22



should not be charged to this account, but to the account benefited by their use

Following is a list of some of the items chargeable to this account:

Belts and belt fixtures.	Light (lanterns and fixtures, oil, lampwick, torches, candles, incandescent lamps, arc light globes and carbons).
Boilers and boiler fittings.	Lubricants.
Bolts.	Lumber.
Brooms	Motors and parts (for shop use only).
Charcoal.	Nails.
Clutches.	Nuts.
Coal.	Piping.
Coke.	Pipe covering.
Cotters.	Pipe fittings.
Cranes.	Pulleys.
Draft machinery.	Pumps.
Engines and parts.	Screws.
Engine appliances and fixtures.	Shafting.
Fire brick.	Stacks.
Fire clay.	Steam fittings.
Forges.	Steel.
Freight.	Tools, machine.
Fuel.	Tools, hand.
Furnaces and parts.	Washers.
Hauling.	Waste.
Heaters, feed water.	Water.
Hoists.	Welding compounds.
Ice, for ice water.	
Iron.	
Labor.	

### Transportation.

#### OPERATION OF POWER PLANT.\*

##### 10. POWER PLANT WAGES.

Charge to this account all expenditures for operation of power plant, except labor employed in making repairs or renewals.

This includes the wages of the following employes:

Boiler cleaners.	Generator tenders.
Chief engineer.	Other labor (boiler room).
Engineers.	Other labor (engine room).
Firemen.	Switch board tenders.
Coal passers.	Water tenders.
Oilers.	

##### 11. FUEL FOR POWER.

Charge to this account all expenditures for coal, oil or gas used as fuel, or other fuel used at power plant, including freight and hauling.

##### 12. WATER FOR POWER.

Charge to this account all expenditures for water used to produce steam or to operate a water-power plant

##### 13. LUBRICANTS AND WASTE FOR POWER PLANT.

Charge to this account all expenditures for lubrication of power plant, including oil, grease, waste, rags, etc

##### 14. MISCELLANEOUS SUPPLIES AND EXPENSES OF POWER PLANT.

Charge to this account all expenditures for labor in the power plant not otherwise provided for.

Following is a list of some of the items chargeable to this account:

Boiler compound.	descent lamps, arc light globes and carbons).
Boiler inspection.	Matches.
Brooms.	Mops.
Brushes, flue.	Oil cans.
Brushes, for generators.	Packing.
Brushes, for scrubbing.	Polish.
Buckets.	Sand paper.
Chamois skins.	Soap.
Dusters.	Sponges.
Emery cloth.	Sprinkling cans.
Fire buckets.	Tools.
Fire extinguishers.	Water (except water charged in account No. 12).
Garnet paper.	Water gauge glasses.
Hose.	Waste cans.
Ice, for ice water.	
Light lanterns and fixtures, oil, lampwick, torches, candles, incan-	

##### 15. HIRED POWER.

Charge to this account all expenditures for power purchased from other companies or power plants.

\*Income from the sale of power, to the extent only of the cost of producing the power sold, should be credited to operation of power plant. Profit or loss resulting from the sale of power should be carried directly to Income Account, as "Income from other sources," or as a "Deduction from income."

### CAR SERVICE.

#### 16. SUPERINTENDENCE OF TRANSPORTATION.

Charge to this account wages of division superintendents, their assistants and aids, road officers, inspectors, and others employed in superintending transportation.

#### 17. WAGES OF CONDUCTORS.

Charge to this account wages of conductors engaged in operating revenue cars.

#### 18. WAGES OF MOTORMEN.

Charge to this account wages of motormen engaged in operating revenue cars.

#### 19. WAGES OF OTHER CAR SERVICE EMPLOYEES.

Charge to this account wages of starters, transfer agents, switch-tenders, trolley-men, trail-car-couplers and other car-service employes.

#### 20. WAGES OF CAR HOUSE EMPLOYEES.

Charge to this account wages of car house foremen, watchmen, car placers, car-shifters, car and motor-inspectors, car-cleaners, lamps and headlight-tenders, car-oilers, car-stove firemen, trolley-oilers and other car house employes not engaged in making repairs or renewals.

The cost of shifting cars for the purpose of repairs or renewals should be charged to account No. 6 or 7.

#### 21. CAR SERVICE SUPPLIES.

Charge to this account all expenditures for lubricants and waste for cars and electric equipment of cars, incandescent lamps, oil and other supplies for lighting cars, water and other supplies for cleaning cars, fuel for heating cars, bell and register-cord, trolley-rope, commutator-brushes, tools and other materials and supplies, except such as are used for repairs or renewals of cars or electric equipment of cars.

Following is a list of some of the items chargeable to this account:

Batteries, dry, for electric bells in cars.	Lamp wicks.
Bell cord.	Lubricants.
Brooms, for cars.	Matches.
Brushes, for car washing.	Mops.
Brushes, for motors.	Oil cans.
Buckets, for car washing.	Pokers.
Candles.	Polish.
Chamois skins.	Rags.
Chimneys for headlights.	Register cord.
Coal hods for cars.	Shakers.
Dusters.	Shovels.
Fuel for cars.	Soap.
Fuses.	Sponges.
Hose, for car washing.	Stove blacking.
Illuminating oil.	Tools.
Incandescent lamps.	Trolley rope.
Kindling.	Waste.
	Water, for car washing.

#### 22. MISCELLANEOUS CAR SERVICE EXPENSES.

Charge to this account all expenditures for secret inspection, transfers and tickets, conductors' books, punches, portable registers, tools for motormen, employes' badges and uniforms; cost of getting derailed cars on track and removing obstructions and wreckage; miscellaneous expenses of car houses, including fuel, light, water (except water used for car washing) and ice, and all other car service expenses not otherwise provided for.

Water used for car washing should be charged to account No. 21.

Following is a list of some of the items chargeable to this account:

Badges, for employes.	Incandescent lamps, arc light globes and carbons).
Buckets, for car houses.	Portable registers.
Brooms, for car houses.	Secret inspection expenses.
Conductors' books.	Sprinkling cans.
Conductors' fare boxes.	Tickets.
Conductors' punches.	Tools.
Fire buckets.	Tools for motormen.
Fuel for car houses.	Transfers.
Fire extinguishers.	Uniforms.
Hose for car houses.	Water (except water for car wash-
Ice for ice water.	ing).
Light (lanterns and fixtures, oil, lamp wicks, torches, candles, in-	Wrecking expenses.

#### 23. CLEANING AND SANDING TRACK.

Charge to this account all expenditures for cleaning, greasing, watering, sprinkling and removing dirt from track, sanding track, including wages of men engaged in the work, cost of sand and of

hanging, drying and distributing same, cost of track-brooms and other tools, curve-grease, water for sprinkling and watering track, and all other supplies and expenses incident to the work.

The feed and keep of horses used in connection with this work should be charged to account No. 30.

The cost of repairs and renewals of harness and wagons, water, sprinkling and sand-cars used in connection with this work should be charged to account No. 8.

This account should not include cost of sprinkling rendered necessary by repairs or construction of track or paving.

The cost of sprinkling street (except tracks) in front of or adjacent to company's property should be charged to account No. 32.

Following is a list of some of the items chargeable to this account:

Curve grease.	Shovels.
Fuel for sand dryer.	Track brooms.
Sand.	Track brushes.
Sand dryer and parts.	Water.

#### 24. REMOVAL OF SNOW AND ICE.

Charge to this account all expenditures for removal of snow and ice from tracks, whether done by the company or otherwise, including labor, material, tools and expenses, cost of salt and delivering same in ear-houses or bins, and the wages of men engaged in salting track and operating snow-plows, sweepers, scrapers, etc.

The feed and keep of horses used in connection with this work should be charged to account No. 30.

The cost of repairs and renewals of harness, wagons, salt-cars, snow-plows, sweepers, scrapers and miscellaneous snow equipment used in connection with this work should be charged to account No. 8.

#### General.

#### 25. SALARIES OF GENERAL OFFICERS.

Charge to this account salaries of President, Vice-President, Secretary, Treasurer, Auditor, General Manager, Assistant General Manager, Chief Engineer, General Superintendent, Purchasing Agent and all other officers whose jurisdiction extends over the entire system.

#### 26. SALARIES OF CLERKS.

Charge to this account the salaries of bookkeepers, cashiers, receivers, paymasters, stenographers, clerks employed in counting cash, tickets and transfers, and all other clerks employed in the general office or elsewhere.

#### 27. PRINTING AND STATIONERY.

Charge to this account all expenditures for printing, stationery and stationery supplies, except as hereinafter provided.

The cost of printing transfers and tickets should be charged to account No. 22.

The cost of printing briefs and other legal papers should be charged to account No. 34 or 35.

The cost of printing signs, posters and other advertising matter should be charged to account No. 31.

Following is a list of some of the items chargeable to this account:

Arm rests.	Paper cutters.
Binders.	Paper fasteners.
Blanks.	Paper files.
Blank books.	Paper weights.
Blotters.	Pencils.
Blotting paper.	Pencil erasers.
Carbon paper.	Pens.
Coin bags.	Pen holders.
Copy (impression) books.	Pen racks.
Copying brushes.	Pina.
Dating stamps.	Printing (except printing charged to accounts Nos. 22, 31, 34, 35).
Envelopes.	Rubber bands.
Eyelets.	Rubber stamps.
Eyelet punches.	Rulers.
Erasers.	Scrap books.
Hektographs.	Sealing wax.
Indexes.	Seals.
Ink.	Shears.
Ink stands.	Shipping tags.
Ink erasers.	Shipping tickets.
Letter presses.	Short hand books.
Mechanical calculators.	Sponges.
Mimeographs.	Sponge cups.
Money tags.	Tissue (impression) paper.
Money wrappers.	

Mucilage and brushes.  
Numbering stamps.  
Oil paper.  
Paper (all kinds).  
Paper baskets.  
Paper clips.

Type writer supplies.  
Twine.  
Type writers.  
Waste baskets.  
Wrapping paper.

#### 28. MISCELLANEOUS OFFICE EXPENSES.

Charge to this account the cost of office supplies, repairs and renewals of office furniture, wages of janitors, porters and messengers, and all other office expenses.

The cost of printing, stationery and stationery supplies should be charged to account No. 27, except as otherwise provided.

Following is a list of some of the items chargeable to this account:

Brooms.	Newspapers.
Brushes.	Periodicals.
Buckets.	Postage.
Chamois skins.	Soap.
Dusters.	Sponges.
Fuel.	Sprinkling cans.
Ice.	Towels.
Internal revenue stamps.	Towel service.
Light.	Water.
Mopa.	

#### 29. STORE ROOM EXPENSES.

Charge to this account all salaries and expenses in connection with store-rooms, including cost of sending material and supplies from general store-room to branch store-rooms, and the collecting of scrap material.

#### 30. STABLE EXPENSES.

Charge to this account the cost of feed, keep and shoeing of horses, replacing horses lost by death or worn out in service, depreciation in value of horses, and all other stable expenses.

This account should include the stable expenses of all horses regardless of where they are used.

Repairs and renewals of harness and vehicles should be charged to account No. 8.

Following is a list of some of the items chargeable to this account:

Bedding.	Horse shoeing supplies.
Blankets.	Horse shoeing (by contract).
Brooms.	Hose.
Brushes.	Hostlers, wages of.
Buckets.	Ice.
Chamois skins.	Light.
Curry combs.	Medicine.
Dusters.	Salt.
Feed.	Sponges.
Fire buckets.	Sprinkling cans.
Fire extinguishers.	Stablemen, wages of.
Fuel.	Veterinarian (salary or fees).
Horse shoers, wages of.	Water.

#### 31. ADVERTISING AND ATTRACTIONS.

Charge to this account the cost of advertising of every description, including printing hand-bills, dodgers, posters, folders, etc.; net expense of music, parks, park properties and resorts (after deducting all income from admittance fees, sale of privileges, etc.) and all donations made and other expenses incurred for the purpose of attracting travel.

#### 32. MISCELLANEOUS GENERAL EXPENSES.

Charge to this account the cost of public telephone service, maintaining and operating private telephone system, telegrams, subscriptions and donations (except those provided for in account No. 31), traveling expenses of general officers and others connected with general office, and contingent expenses connected with the general management not otherwise provided for.

#### 33. DAMAGES.

Charge to this account all expenditures on account of property damaged and persons killed or injured, salaries and expenses of claim agents, investigators, adjusters and others engaged in the investigation of accidents and adjustment of claims, salaries, fees and expenses of surgeons and doctors, nursing, hospital attendance, medical and surgical supplies, fees and expenses of coroners and undertakers, fees of witnesses and others, except lawyers' fees and court costs and expenses.

Following is a list of some of the items chargeable to this account:

Accident insurance premiums.	Doctors' fees or salaries.
Adjusters' expenses.	Funeral expenses.
Adjusters' salaries.	Hospital expenses.
Claim agents' expenses.	Investigators' expenses.



Claim agents' salaries.	Investigators' salaries.
Coroners' fees and expenses.	Medical supplies.
Damage claims for ejection from cars.	Nurses' expenses.
Damage claims for electrolysis.	Nurses' fees.
Damage claims for horses killed or injured.	Premiums for accident insurance.
Damage claims for persons killed or injured.	Surgeons' expenses.
Damage claims for property damaged.	Surgeons' fees.
Doctors' expenses.	Surgeons' salaries.
	Surgical supplies.
	Undertakers' expenses.
	Undertakers' fees.
	Witnesses' expenses.
	Witnesses' fees.

**34. LEGAL EXPENSES IN CONNECTION WITH DAMAGES.**

Charge to this account all legal expenses incurred in connection with the defense or settlement of damage claims.

The compensation of the general solicitor or counsel and other attorneys engaged partly in the defense and settlement of damage suits and partly in other legal work should be apportioned between this account and account No. 35.

The term "legal expenses" should be understood to include the salary of general solicitor or counsel, salaries, fees and expenses of attorneys, fees of court stenographers, unless included in court costs, cost of law-books, printing of briefs, court-records and other papers, court costs, expenses connected with taking depositions, and all other court expenses.

**35. OTHER LEGAL EXPENSES.**

Charge to this account all legal expenses except those incurred in connection with the defense or settlement of damage claims.

The compensation of the general solicitor or counsel and other attorneys engaged partly in the defense and settlement of damage suits and partly in other legal work should be apportioned between this account and account No. 34.

**36. RENT OF LAND AND BUILDINGS.**

Charge to this account all rents paid for land and buildings used in the operation of the road.

**37. RENT OF TRACKS AND TERMINALS.**

Charge to this account all rents paid for tracks and terminals, bridge rentals and tolls.

The word "terminals" is not meant to refer to depots, car houses or other buildings at the terminus of the road. Rents for these should be charged to account No. 36.

**38. INSURANCE.**

Charge to this account the cost of fire and boiler insurance.

**39. TAXES.**

Charge to this account taxes on real and personal property used in the operation of the road, track-taxes, franchise-taxes, taxes upon capital stock, taxes upon gross earnings, car-licenses, and other vehicle licenses.

**Monthly Report.**

**EARNINGS FROM OPERATION.**

Passenger Receipts .....	.....
Chartered Cars .....	.....
Freight .....	.....
Mail .....	.....
Express .....	.....
Gross Earnings from Operation.....	.....
Operating Expenses .....	.....
Net Earnings from Operation.....	.....

**INCOME FROM OTHER SOURCES.**

Advertising .....	.....
Rent of Land and Buildings.....	.....
Rent of Tracks and Terminals.....	.....
Interest and Dividends on Securities Owned...	.....
Interest on Deposits .....	.....
Miscellaneous .....	.....
Total Income from other Sources.....	.....
Gross Income .....	.....

**DEDUCTIONS FROM INCOME.**

Interest on funded debt.....	.....
Interest on real estate mortgages.....	.....
Interest on floating debt.....	.....
Rentals of leased lines .....	.....
Miscellaneous .....	.....
Total deductions from income.....	.....
Net Income .....	.....

**DEDUCTIONS FROM NET INCOME.**

Preferred stock dividends .....	.....
Common stock dividends .....	.....
Additions and betterments .....	.....
Sinking fund .....	.....
Total deductions from net income.....	.....
Surplus for month .....	.....
Surplus carried forward from last month, as per balance sheet .....	.....
Surplus at end of month, as per general balance sheet .....	.....

**Annual Report.**

**EARNINGS FROM OPERATION.**

Passenger receipts .....	.....
Chartered cars .....	.....
Freight .....	.....
Mail .....	.....
Express .....	.....
Gross earnings from operation .....	.....
Operating expenses .....	.....
Net earnings from operation.....	.....

**INCOME FROM OTHER SOURCES.**

Advertising .....	.....
Rent of land and buildings.....	.....
Rent of tracks and terminals.....	.....
Interest and dividends on securities owned....	.....
Interest on deposits .....	.....
Miscellaneous .....	.....
Total income from other sources.....	.....
Gross income .....	.....

**DEDUCTIONS FROM INCOME.**

Interest on funded debt .....	.....
Interest on real estate mortgages.....	.....
Interest on floating debt .....	.....
Rentals of leased lines .....	.....
Miscellaneous .....	.....
Total deductions from income.....	.....
Net income .....	.....

**DEDUCTIONS FROM NET INCOME.**

Preferred stock dividends .....	.....
Common stock dividends .....	.....
Additions and betterments .....	.....
Sinking fund .....	.....
Total deductions from net income.....	.....
Surplus for year .....	.....
Surplus carried forward from beginning of fiscal year, as per balance sheet.....	.....
Surplus at close of fiscal year, as per general balance sheet .....	.....

**REMARKS.**

If deficit be shown in monthly or annual report, substitute the word "Deficit" for "Surplus."

In monthly reports, the month's proportion of each item under "Income from Other Sources," "Deductions from Income," and "Deductions from Net Income" should be debited or credited, currently, each month. If the exact amount is not known, it should be estimated.

In monthly reports, charge to accounts Nos. 36, 37, 38 and 39, respectively, the month's proportion of the total annual charge for rent of land and buildings used in the operation of the road, rent of tracks and terminals, insurance and taxes, as nearly as the same can be ascertained, and not the amount which may have been actually paid in the month.

If a company conducts the business of selling or renting advertising space in its cars, instead of leasing the privilege so to do to someone else, the amount shown as "Income from Advertising" should be the net income from this source after deducting all expenses of conducting the business.

"Income from Rent of Land and Buildings" refer to rents received from real estate not used in the operation of the road, and the amount shown in the report should be the net amount received after deducting all taxes, insurance, water rents or rates,

cost of repairs, and other expenses connected with such real estate.

Under "Miscellaneous Income" should be shown the income from sale of power in excess of the actual cost of producing the power sold.

Income from the operation of parks, park-resorts, or similar property, should appear under "Miscellaneous Income," and the amount shown should be the net amount received after deducting all expenses connected with such operation.

If advertising results in a loss, if power is sold at less than the cost of producing it, or if the expenses in connection with real estate not used in the operation of the road exceed the income from that source, the loss or deficit should appear under "Miscellaneous Deductions from Income."

The following alphabetical list of items chargeable to operating expense accounts of electric railways shows the account, or accounts, to which each item is chargeable. The purpose of this list is that it may serve as a guide in the use of the classification of operating expense accounts recommended by the Street Railway Accountants' Association of America, and bring about a standard method of making charges. It is not a complete list of all items chargeable to the operating expense accounts of electric railway companies, but is an index of many, and perhaps most, of such items.

### Alphabetical List of Items.

#### A.

Accident insurance premiums.....	33
Adjusters' expenses and salaries.....	33
Advertising .....	31
Aids .....	16
Ammeters (electric plant) .....	5
Architects .....	3
Arc lights (light) .....	1, 2, 3
Arc light carbons (light) .....	1, 2, 9, 14, 22, 28, 29, 30
Arc light fixtures (light) .....	1, 2, 3
Arc light globes (light) .....	1, 2, 9, 14, 22, 28, 29, 30
Armatures and parts .....	5, 7
Armature winders (mechanics) .....	5, 7, 9
Arm rests .....	27
Ash-conveying machinery (steam plant) .....	4
Assistant division superintendents .....	16
Assistant general manager .....	25
Attorneys' expenses, fees and salaries.....	34, 35
Attractions for promoting travel.....	31
Auditor .....	25
Awnings .....	3
Axles, car .....	6, 8
B.	
Babbitt metal .....	4, 5, 7, 9
Badges, employees' .....	22
Ballast .....	1
Batteries for electric bells in cars .....	21
Batteries, storage (electric plant or cars).....	5, 7
Bearings for electric equipment of cars.....	7
Bedding (stable) .....	30
Bells, cars .....	6
Bell cord .....	21
Bell-cord fixtures .....	6
Belts for steam plant .....	4
Belts for shops .....	9
Belt fixtures .....	4, 9
Belt lighteners .....	4, 9
Binders (office) .....	27
Blacksmiths (mechanics) .....	1, 2, 3, 4, 5, 6, 7, 8, 9
Blank books .....	27
Blank forms .....	27
Blankets (stable) .....	30
Blotters .....	27
Blotting paper .....	27
Boilers, steam plant .....	4
Boilers, shop .....	9
Boiler appliances .....	4, 9
Boiler cleaners .....	9, 10
Boiler compounds .....	9, 14
Boiler fittings .....	4, 9
Boiler inspection (city or insurance companies) .....	9, 14
Boiler room employes (power plant) .....	10
Bolts .....	1, 2, 3, 4, 5, 6, 7, 8, 9
Bolt ends .....	1, 2, 3, 4, 5, 6, 7, 8, 9
Books (blank-books) .....	27
Book-keepers .....	26
Boosters (electric plant) .....	5
Boxes for lightning arresters .....	2
Braces, rail .....	1
Brakes (hand or power) .....	6, 8
Brake appliances (hand or power) .....	6, 8
Brake-shoes .....	6, 8
Brasses (car brasses) .....	6, 7, 8
Brass fixtures (cars) .....	6, 8
Brass trimmings (cars) .....	6
Brick .....	1, 3
Bridges .....	1
Bridge rentals .....	37
Bridge tolls .....	37
Briefs (printplug of law briefs) .....	34, 35
Brooms, corn .....	9, 14, 21, 22, 28, 29, 30
Brooms, stable .....	30
Brooms, track .....	23
Brushes for car washing .....	21
Brushes, flue .....	14
Brushes for generator .....	14
Brushes, horse .....	30
Brushes (cars or electric equipment of cars).....	21
Brushes, scrubbing .....	9, 14, 21, 22, 28, 29, 30
Brush-holders and parts (electric equipment of cars).....	7
Buckets .....	9, 14, 21, 22, 28, 29, 30
Buggies .....	8
Buggies (material or repair parts).....	8
Builders' hardware .....	3
Building material .....	3
Building permits .....	3
Bumpers (cars) .....	6, 8
C.	
Cables, switchboard .....	5
Calculators, mechanical .....	27
Candles (light) .....	1, 2, 9, 14, 21, 22, 28, 29, 30
Canvas or duck for cars .....	6, 7, 8
Carbons for arc lights (light).....	1, 2, 9, 14, 22, 28, 29, 30
Carbon paper .....	27
Carpenters (mechanics) .....	1, 2, 3, 4, 5, 6, 7, 8, 9
Cars, baggage .....	6
Cars, express .....	6
Cars, freight .....	6
Cars, mail .....	6
Cars, passenger .....	6
Cars, private .....	6
Cars, salt .....	8
Cars, sand .....	8
Cars, sprinkling .....	8
Cars, supply .....	8
Cars, water .....	8
Cars, work .....	8
Car cleaners .....	20
Car curtains .....	6
Car curtain fixtures .....	6
Car couplers .....	19
Car house employes .....	20
Car house foremen .....	20
Car inspectors .....	20
Car oilers .....	20
Car placers .....	20
Car seats .....	6
Car seat coverings .....	6
Car seat fixtures .....	6
Car service employes .....	19
Car shifters .....	20
Car signs .....	6
Car sign fixtures .....	6
Car springs .....	6
Car steps .....	6
Car stoves .....	6
Car stove firemen .....	20
Car stove fixtures .....	6
Car wiring .....	7
Carts .....	8
Carts (material or repair parts) .....	8
Cashiers .....	26
Cement .....	1, 2, 3, 4, 9
Chairs, for rails .....	1
Chamois skins .....	9, 14, 21, 22, 28, 29, 30
Charcoal .....	2, 9
Chief engineers, civil, electrical, mechanical.....	25
Chief engineers (of power plant) .....	10
Chimneys, for headlights .....	21
Cinders, for ballast .....	1
Circuits (heat, light, power), for cars.....	7
Circuit-breakers (electric plant or cars).....	5, 7
Cisterns .....	3
Claim agents' expenses and salaries.....	33
Clamps, for poles .....	2
Clamps, for welding rail joints.....	1
Clerks .....	1, 2, 3, 4, 5, 6, 7, 8, 9, 26, 29
Clutches (steam plant or shop) .....	4, 9
Coal, for heating .....	1, 2, 9, 21, 22, 23, 28, 29, 30
Coal, for power .....	11
Coal-conveying machinery (steam plant).....	4
Coal hods (for car stoves).....	21



Coal passers (steam plant).....	10
Coin bags .....	27
Coke for heating .....	1, 2, 9, 21, 22, 23, 28, 29, 30
Coke, for welded rail-joints .....	1
Commutators and parts (electric plant or cars).....	5, 7
Condensers (steam plant) .....	4
Conductors (of revenue cars).....	17
Conductors, for underground trolley.....	2
Conductors' books .....	22
Conductors' fare boxes .....	22
Conductors' punches .....	22
Conduits .....	2
Contacts (for surface-contact roads) .....	2
Contact boxes (for surface-contact roads).....	2
Contact shoes (for surface-contact cars).....	7
Contact shoes (for half-rail cars).....	7
Contingent expenses .....	32
Controllers and parts (cars).....	7
Copylag (impression) books .....	27
Copying brushes .....	27
Cord, bell .....	21
Cord, for electric line.....	2
Cord, register .....	21
Cord, trolley .....	21
Coroners' expenses and fees .....	33
Cotters .....	6, 7, 8, 9
Counsel .....	34, 35
Court costs .....	34, 35
Court records .....	34, 35
Court stenographers' fees .....	34, 35
Cranes (steam plant, shop, car houses) .....	4, 9
Crews operating snow plows.....	24
Crews (operating electric sweepers).....	24
Crews (operating work cars).....	23, 24, 29
Cross-arms, iron, for poles.....	2
Cross-arms, wood, for poles.....	2
Crossings, track (special work).....	1
Crossings, electric line .....	2
Cross-overs, track (special work).....	1
Culverts .....	1
Curry combs .....	30
Curves, track (special work).....	1
Curve grease .....	23
Cut-out boxes and parts (cars) .....	7

D.

Damage claims, ejection from cars.....	33
Damage claims, electrolysis .....	33
Damage claims, horses injured or killed.....	33
Damage claims, persons injured or killed.....	33
Damage claims, property damaged .....	33
Damage claims, vehicles damaged .....	33
Dashes and parts (cars).....	6, 8
Dating stamps (office) .....	27
Depreciation of horses .....	30
Deposition expenses .....	34, 35
Division superintendents .....	16
Division superintendents, assistant .....	16
Doctors' expenses, fees and salaries .....	33
Dodgers (printing) .....	31
Donations, to attractions .....	31
Donations, other than to attractions .....	32
Draft machinery .....	4, 9
Draftsmen .....	1, 2, 3, 4, 5, 6, 7, 8, 9
Drains .....	1, 3
Draw-bars for cars .....	6, 8
Duck or canvas for cars.....	6, 7, 8
Dusters, feather .....	9, 14, 21, 22, 28, 29, 30

E.

Economizers (steam plant) .....	4
Electric heaters, for cars .....	6
Electric sweepers .....	8
Electricians (mechanics) .....	2, 3, 5, 6, 7, 8, 9
Electroliers (cars).....	6, 8
Electrolysis .....	33
Emery cloth .....	1, 2, 3, 4, 5, 6, 7, 8, 9, 14
Employees (indexed by occupation).....	
Engineers (chief engineers, civil, electric, mechanical).....	25
Engineers, chief of power plant .....	10
Engineers (civil, electric, mechanical).....	1, 2, 3, 4, 5, 6, 7, 8, 9
Engineers in power plant or shop.....	9, 10
Engines (steam plant or shop).....	4, 9
Engine appliances .....	4, 9
Engine fixtures .....	4, 9
Engine parts .....	4, 9
Envelopes .....	27
Erasers .....	27
Excavations, for buildings .....	3
Expenses, contingent .....	32
Expenses, depositions .....	34, 35
Expenses, store-room .....	29
Eyelets (office) .....	27
Eyelet punches (office) .....	27

F.

Fare boxes (cars) .....	6
Fare boxes, conductors' .....	22
Fare registers .....	6
Feather dusters .....	9, 14, 21, 22, 28, 29, 30
Feed .....	30
Feeders, ground .....	2
Feeders, overhead .....	2
Feeder terminals (electric plant).....	5
Feeders, underground .....	2
Fields and parts .....	5, 7
Fences (buildings and enclosures) .....	3
Fences, park .....	31
Fences, right of way .....	1
Fenders and parts (cars) .....	6, 8
Fire brick (steam plant or shop).....	4, 9
Fire buckets .....	9, 14, 22, 28, 29, 30
Fire clay (steam plant or shop).....	4, 9
Fire extinguishers .....	9, 14, 22, 28, 29, 30
Firemen (power plant).....	10
Firemen (car stoves) .....	20
Fish-plates, track (rail fastenings) .....	1
Fixtures for buildings .....	3
Floor mats for cars .....	6
Folders .....	31
Forges (blacksmith shop) .....	9
Foremen, of car houses .....	20
Forms, blank .....	27
Foundations for buildings .....	3
Frames, motor .....	7
Freight .....	1, 2, 3, 4, 5, 6, 7, 8, 9
Frogs, track (special work).....	1
Fuel (coal, coke, kindling) .....	1, 2, 9, 21, 22, 23, 28, 29, 30
Fuel for power .....	11
Fuel for car stoves .....	21
Funeral expenses .....	33
Furnaces (boiler) .....	4, 9
Fuses (cars) .....	21

G.

Garret paper .....	1, 2, 3, 4, 5, 6, 7, 8, 9, 14
Gas for fuel for power .....	11
Gasoline, for electric line .....	2
Gates (cars) .....	6
Guard-rails, track (special work).....	1
Gears (electric equipment of cars).....	7
Gear cases and parts.....	7
General manager .....	25
General manager, assistant.....	25
General solicitor .....	34, 35
General superintendent .....	25
Generators and parts (electric plant).....	5
Generator tenders (power plant).....	10
Glass .....	3, 6, 8
Globes for arc lamps (light).....	1, 2, 9, 14, 22, 28, 29, 30
Glue for car repairs.....	6, 8
Gongs for cars.....	6, 8
Grab handles for cars.....	6, 8
Grading, for buildings.....	3
Grading, for track.....	1
Grate bars, for furnaces (steam plant or shop).....	4, 9
Gravel, for track .....	1
Grease for power plant.....	13
Grease for cars .....	21
Grease for tracks .....	23
Grease for wagons and other vehicles .....	30

H.

Hand-bills .....	31
Hangers for electric line .....	2
Hardware (buildings) .....	3
Harness (buggy, cart, wagon) .....	8
Harness (material or repair parts).....	8
Hauling of material.....	1, 2, 3, 4, 5, 6, 7, 8, 9
Hauling of salt .....	24
Headlights and parts (cars).....	6, 8
Headlight tenders .....	20
Heat circuit, for cars .....	7
Heaters, electric, for cars .....	6
Heaters, feedwater .....	4, 9
Heating apparatus for buildings.....	3
Heating fixtures for buildings.....	3
Hektographs .....	27
Hired power .....	15
Holsts (steam plant, shop or car house).....	4, 9
Horses, depreciation of .....	30
Horses, replacement of .....	30
Horse shoeing .....	30
Horse-shoeing supplies .....	30
Horse-shoers .....	30
Hoae.....	9, 14, 21, 22, 28, 29, 30
Hospital expenses (persons injured) .....	33
Hostlers .....	30

<b>I.</b>	
I-beams, for buildings .....	3
Ice, for ice water .....	1, 2, 9, 14, 22, 28, 29, 30
Impression paper .....	27
Impression books .....	27
Incandescent lamp fixtures (light) .....	1, 2
Incandescent lamps (light) .....	1, 2, 9, 14, 21, 22, 28, 29, 30
Indexes (office) .....	27
Injectors, steam .....	4, 9
Ink .....	27
Ink-stands .....	27
Inspectors, secret .....	22
Inspectors, cars .....	20
Inspectors, motors .....	20
Inspectors, not secret .....	16
Insulating material for electric equipment of cars .....	7
Insulating Tape .....	2, 7
Insulators, overhead .....	2
Insulators, third-rail .....	2
Insulators, underground-trolley .....	2
Insurance, accident .....	33
Insurance, boiler .....	38
Insurance, fire .....	38
Internal revenue stamps .....	38
Investigators' expenses and salaries .....	23
Iron .....	1, 2, 3, 4, 5, 6, 7, 8, 9
<b>J.</b>	
Janitors .....	28
Joints, track (not welded) .....	1
Joints, track (welded) .....	1
<b>K.</b>	
Kindling wood (fuel for heating) .....	1, 2, 9, 21, 22, 23, 28, 29, 30
<b>L.</b>	
Laborers (indexed by occupation) .....	
Labor, manual (maintenance accounts) .....	1, 2, 3, 4, 5, 6, 7, 8, 9
Lamps, incandescent (light) .....	1, 2, 9, 14, 21, 22, 28, 29, 30
Lamp tenders .....	20
Lampwicks (light) .....	1, 2, 9, 14, 21, 22, 28, 29, 30
Lanterns and fixtures (light) .....	1, 2, 9, 14, 22, 28, 29, 30
Laths .....	3
Lathes .....	9
Law-books .....	34, 35
Law briefs .....	34, 35
Legal expenses, in connection with damages .....	34, 35
Legal expenses, other than damages .....	34, 35
Legal papers .....	34-35
Letter books .....	27
Letter presses .....	27
Licenses, car .....	39
Licenses, vehicle .....	39
Licenses, wagon .....	39
Life-guards for cars .....	6, 8
Light (lanterns, oil, wicks, torches, candles, incandescent lamps, arc light globes and carbons) .....	1, 2, 9, 14, 21, 22, 28, 29, 30
Light circuits for cars .....	7
Lighting apparatus for buildings .....	3
Lighting fixtures for buildings .....	3
Lightning arresters and parts (line, electrical plant, cars) .....	2, 5, 7
Lime, for buildings .....	3
Linemen .....	2
Linseed oil (paint) .....	2, 3, 6, 8
Lubricants .....	9, 13, 21, 30
Lubricators for engines .....	4, 9
Lumber .....	1, 3, 6, 8, 9
<b>M.</b>	
Machinery, ash-conveying .....	4
Machinery, coal-conveying .....	4
Machinery, mechanical-draft .....	4
Machinery, water-power .....	4
Machinists (mechanics) .....	1, 2, 3, 4, 5, 6, 7, 8, 9
Magnets, for surface-contact roads .....	2
Manager (assistant general manager) .....	25
Manager (general manager) .....	25
Man-hole covers, for underground-trolley .....	1
Man-hole covers, for surface-contact roads .....	2
Man-hole frames, for underground-trolley .....	1
Man-hole frames, for surface-contact roads .....	2
Matches .....	9, 14, 21, 28, 29, 30
Material for building .....	3
Material not otherwise specified .....	1, 2, 4, 5, 6, 7, 8, 9
Mechanics (blacksmiths, carpenters, painters, machinists, electricians, armature winders, motor repairers) .....	1, 2, 3, 4, 5, 6, 7, 8, 9
Medical supplies (damages) .....	33
Medicine for horses .....	30
Messengers .....	28
Meters water .....	3, 4, 9
Mimeographs .....	27
Mirrors for cars .....	6
Molds for welded joints .....	1
Money tags .....	27
Money wrappers .....	27
Mops .....	9, 14, 21, 22, 28, 29, 30
Motormen (of revenue cars) .....	18
Motormen (of work cars) .....	1, 2, 23, 24, 29
Motor repairers .....	7
Motors, complete, for cars .....	7
Motor frames .....	7
Motor inspectors .....	20
Motors and motor parts, for shop .....	9
Mucilage .....	27
Mucilage brushes .....	27
Music, for promoting travel .....	31
<b>N.</b>	
Nails .....	1, 3, 6, 9
Newspapers .....	28
Numbering stamps (office) .....	27
Nurses' expenses and fees (damage cases) .....	33
Nuts, for bolts .....	1, 2, 3, 4, 5, 6, 7, 8, 9
Nut-locks, for track (rail fastenings) .....	1
<b>O.</b>	
Officers (indexed by titles or positions) .....	
Office furniture, repairs and renewals of .....	28
Oil, for fuel for power .....	11
Oil, lubricating .....	9, 13, 21, 30
Oil, for light .....	1, 2, 9, 14, 21, 22, 28, 29, 30
Oil-boxes for cars .....	6, 8
Oil-cans .....	14, 21
Oil-paper (office) .....	27
Oilers, car .....	20
Oilers, power plant .....	10
Oilers, trolley .....	20
Oiling devices, for engines .....	4, 9
<b>P.</b>	
Packing, for engines .....	9, 14
Painting material (linseed oil, turpentine, varnish, white lead, painters' brushes and supplies) .....	2, 3, 6, 8
Painters (mechanics) .....	2, 3, 6, 8
Paper (writing paper, wrapping paper) .....	27
Paper baskets .....	27
Paper clips .....	3
Paper cutters .....	27
Paper fasteners .....	27
Paper files .....	27
Paper weights .....	27
Parks and park properties, for promoting travel .....	31
Pavers (laborers) .....	1, 2, 3
Paving, in connection with buildings .....	3
Paving, in connection with electric line .....	2
Paving, in connection with tracks .....	1
Paving material .....	1, 2, 3
Pedestals, for cars .....	6, 8
Pencils .....	27
Pencil erasers .....	27
Pens .....	27
Pen holders .....	27
Pen racks .....	27
Periodicals .....	23
Permits, for buildings .....	3
Pig iron, for welding joints .....	1
Pilots, for cars .....	6, 8
Pinions, for electric equipment of cars .....	7
Pins .....	27
Pins, iron, for cross-arms .....	2
Pins, wood, for cross-arms .....	2
Pipe covering (steam pipe) .....	4, 9
Pipes, drain .....	1, 3
Pipe fittings, steam .....	4, 9
Pipes, gas .....	3
Pipes, sewer .....	3
Pipes, water .....	3
Piping, steam .....	4, 9
Pits, in car houses and shops .....	3
Plaster .....	3
Plows, for underground-trolley cars .....	37
Plumbing .....	3
Pokers, for car stoves .....	21
Poles, iron or wood, for electric line .....	2
Pole fixtures .....	2
Pole tops, for iron poles .....	2
Polish .....	9, 14, 21, 22, 28, 29, 30
Portable registers .....	22
Porters .....	28
Postage .....	28
Posters .....	31
Power circuits, cars .....	7
Power plant labor (boiler room, not otherwise specified) .....	10
Power plant, labor (engine room, not otherwise specified) .....	10
President .....	25
Printing (except transfers, tickets, dodgers, posters, hand-bills, fold- ers, law-books, law briefs, legal papers, charged to accounts 22, 31, 34, 35.) .....	27
Printing (advertising matter) .....	31
Printing (briefs) .....	34, 35



Printing (dodgers) .....31  
 Printing (folders) .....31  
 Printing (hand-bills) .....31  
 Printing (legal papers) .....34, 35  
 Printing (posters) .....31  
 Printing (tickets) .....22  
 Printing (transfers) .....22  
 Pulleys .....4, 9  
 Pumps, steam .....4, 9  
 Punches, conductors' .....22  
 Purchasing agent .....25  
 Purifiers (steam plant).....4

**R.**

Rags.....13, 21  
 Rails, for track .....1  
 Rail bonds, electric line .....2  
 Rail-braces, track (rail fastenings) .....1  
 Rail chairs, track (rail fastenings) .....1  
 Receivers (employes counting receipts) .....26  
 Rattan, for sweepers .....8  
 Receivers, for steam plant .....4  
 Register cord .....21  
 Registers (stationary fare registers) .....6  
 Removing snow .....24  
 Rent of land and buildings .....26  
 Rent of tracks and terminals .....31  
 Rent of bridges .....37  
 Replacing horses .....39  
 Resorts for promoting travel .....31  
 Rheostats for electric plant or cars .....5, 7  
 Rivets .....1, 2, 3, 4, 5, 6, 7, 8, 9  
 Roadmasters .....1  
 Road officers .....16  
 Roofing material .....3  
 Rope (trolley rope) .....21  
 Rubber bands .....27  
 Rubber stamps .....27  
 Rulers .....27  
 Run-offs, track (special work) .....1

**S.**

Salaries (indexed by titles or positions) .....  
 Salt .....24, 30  
 Sand .....1, 2, 3, 23  
 Sand boxes, attached to cars.....6, 8  
 Sand dryer and parts, for drying sand .....23  
 Sand paper.....1, 2, 3, 4, 5, 6, 7, 8, 9, 14  
 Scales, platform .....3  
 Scrap-books .....27  
 Screens, wire (for buildings) .....3  
 Screens, wire (for cars) .....6  
 Screws .....1, 2, 3, 4, 5, 6, 7, 8, 9  
 Seals .....27  
 Sealing wax .....27  
 Seats for cars .....6  
 Seat coverings, for cars .....6  
 Seat fixtures, for cars .....6  
 Secretary .....25  
 Secret inspection .....22  
 Separators (steam plant) .....1  
 Sewer connections, for underground-trolley .....2  
 Sewer connections, for steam plant .....4  
 Sewer traps, for underground trolley .....2  
 Sewering, for buildings .....3  
 Shafting, for steam plant or shop.....4, 9  
 Shafts, for motors .....7  
 Shakers, for car stoves .....21  
 Shears, for office .....27  
 Shelving, for buildings .....3  
 Shipping tags .....27  
 Shipping tickets .....27  
 Short hand books .....27  
 Shovels, for track cleaning .....23  
 Shovels, for removing snow .....24  
 Shovels, for car stoves .....21  
 Side-walks .....3  
 Signals and signalling apparatus .....2  
 Signs and sign fixtures, for cars .....6  
 Slot rails, for underground-trolley .....1  
 Snow-plow crews .....24  
 Snow-shovelers .....24  
 Soap .....9, 14, 21, 22, 28, 29, 30  
 Solder and soldering salts, for electric line.....2  
 Solitors, general .....34, 35  
 Spikes .....1, 3  
 Sponges.....9, 14, 21, 22, 27, 28, 29, 30  
 Sponge cups, for office .....27  
 Sprinkling cans.....9, 14, 22, 28, 29, 30  
 Stabblers .....30  
 Stacks, steam plant or shop .....4, 9  
 Starters .....19  
 Steam fittings, for steam plant or shop.....4, 9  
 Steel .....1, 2, 3, 4, 5, 6, 7, 8, 9

Stenographers .....26  
 Stokers, mechanical .....10  
 Stone .....1, 2, 3  
 Storage batteries, for electric plant .....5  
 Storage batteries, for cars .....7  
 Store keepers .....29  
 Store room clerks .....29  
 Store room employes .....29  
 Store room expenses .....29  
 Stoves, for cars .....6  
 Stove blacking, for car stoves .....21  
 Stove fixtures, for cars .....6  
 Subscriptions, to attractions .....31  
 Subscriptions, other than to attractions .....33  
 Subways .....1  
 Superintendents .....1, 2, 3, 4, 5, 6, 7, 8, 9  
 Superintendents, division .....16  
 Superintendents, assistant division .....16  
 Superintendents, general superintendents .....25  
 Surgeons' expenses, fees and salaries.....33  
 Surgical supplies .....33  
 Suspensions, for electric line .....2  
 Sweepers, electric .....8  
 Sweeper crews .....24  
 Switches, track (special work) .....1  
 Switches, overhead, electric line .....2  
 Switches, for electric plant .....5  
 Switch boards, for electric plant .....5  
 Switch board tenders .....10  
 Switch mates, track (special work) .....1  
 Switch tenders .....19

**T.**

Tanks (steam plant) .....4  
 Tape, insulating .....2, 7  
 Taxes .....39  
 Taxes, on capital stock .....39  
 Taxes, city .....39  
 Taxes, county .....39  
 Taxes, franchise .....39  
 Taxes, on gross earnings .....39  
 Taxes, school .....39  
 Taxes, track .....39  
 Taxes, state .....39  
 Teamsters .....1, 2, 3, 4, 5, 6, 7, 8, 9, 23, 24  
 Telegrams .....32  
 Telephone system, private .....32  
 Telephone service, public .....32  
 Terminals, for electric line .....2  
 Terminals, for electric equipment of cars.....7  
 Terminals, feeder .....5  
 Third rails (third-rail system).....2  
 Tickets, printing of .....22  
 Ties .....1  
 Tie-plates (rail fastenings) .....1  
 Tie-rods (rail fastenings) .....1  
 Time keepers.....1, 2, 3, 4, 5, 6, 7, 8, 9  
 Tissue (impression) paper .....27  
 Tolls, bridge .....7  
 Tools, hand .....1, 2, 3, 4, 5, 6, 7, 8, 9, 13, 21, 22  
 Tools, for motormen .....22  
 Tools (machine tools in shop) .....9  
 Torches (light) .....1, 2, 9, 14, 22, 28, 29, 30  
 Towels .....28  
 Towel service .....28  
 Track brooms, for track cleaning.....23  
 Track cleaners .....23  
 Trail-car couplers .....19  
 Transfers, printing of .....22  
 Transfer agents .....19  
 Transformers (electric plant) .....5  
 Traveling expenses of general officers and others connected with the general office .....22  
 Treasurer .....25  
 Trestles .....1  
 Trolley bases .....7  
 Trolley forks .....7  
 Trolley oilers .....20  
 Trolley poles, for cars .....7  
 Trolley rope .....21  
 Trolley tenders (of revenue cars).....19  
 Trolley tenders (of work cars).....1, 2, 23, 24, 29  
 Trolley wheels and parts (cars).....7  
 Trucks, for cars .....6, 8  
 Truck frames and parts, for cars.....6, 8  
 Tunnels .....1  
 Turpentine (paint) .....2, 3, 6, 8  
 Turn-outs, track (special work) .....1  
 Twine (office) .....27  
 Typewriters and typewriter supplies .....27

**U.**

Undertakers' expenses and fees .....53  
 Uniforms .....22

**V.**

Varnish (paint) .....3, 6, 8

Vehicles (buggies, carts, snow-scrappers, snow-sleds, wagons, work-cars) .....8  
 Ventilating apparatus and fixtures .....3  
 Veterinarian .....30  
 Vice president .....25

W.

Wages (Indexed by occupation) .....  
 Wagons .....8  
 Washers .....1, 2, 3, 4, 5, 6, 7, 8, 9  
 Waste .....9, 13, 21  
 Waste baskets .....27  
 Waste cans .....14  
 Watchman .....1, 2, 3, 4, 5, 6, 7, 8, 9, 20  
 Water .....1, 2, 3, 9, 14, 21, 22, 23, 28, 29, 30  
 Water barrels .....1, 2, 9, 14, 22, 28, 29, 30  
 Water connections .....3, 4, 9  
 Water coolers .....1, 2, 9, 14, 22, 28, 29, 30  
 Water dippers .....1, 2, 9, 14, 22, 28, 29, 30  
 Water, for steam power .....12  
 Water, for operating water-power machinery .....12  
 Water gauge glasses .....14  
 Water meters .....3, 4, 9  
 Water palls .....1, 2, 9, 14, 21, 22, 28, 29, 30  
 Water power machinery .....4  
 Water tenders, for steam plant .....10  
 Water tenders, for water-power plant .....10  
 Welding compound .....9  
 Wells .....3  
 Wheels, for cars .....6, 8  
 Wheels, trolley .....7  
 White lead (paint) .....2, 3, 6, 8  
 Wire, for buildings .....3  
 Wire, feed .....2  
 Wire, guard .....2  
 Wire screens, for buildings .....3  
 Wire screens, for cars .....6  
 Wire, span .....2  
 Wire, strain .....2  
 Wire, supplementary .....2  
 Wire, trolley .....2  
 Wiring cars .....7  
 Witnesses' expenses and fees .....33  
 Woodwork for buildings .....3  
 Woodwork, for cars .....6, 8  
 Work-car crews .....1, 2, 23, 24, 29  
 Wrapping paper .....27  
 Wrecking expenses .....22

Y.

Yokes, for underground trolley .....1

DEATH OF LIEUTENANT TIFFANY.

The pathetic death of Lieut. William Tiffany, more than any other one instance, called the attention of the country to the suffering and hardship endured by the volunteer soldiers returning from the Cuban campaign. It was stated by the attending physician that death was due to stravation while convalescing from fever.



WILLIAM TIFFANY.

Lient. Tiffany was the son of George Tiffany, of the great jewelry house, and the grand-nephew of Commodore Perry. After receiving a finished education and experiencing some years of western life, he settled down in business and became secretary and treasurer of the Sterling Supply & Manufacturing Company. When Colonel Roosevelt organized his regiment of rough riders, Lient. Tiffany enlisted as a private, but was soon promoted to be a corporal, and then a sergeant. His bravery on the battlefield before Santiago won for him his lieutenantcy. He contracted fever at Santiago and was brought to Montauk Point on the notorious Olivette, and later was taken to Boston. With the best of medical attention and tender nursing he was in a fair way to recover, but on August 25 a change for the worse came and he died peacefully with his mother, brother and fiancée about his bedside. He was buried with military honors, his grave being surrounded by his comrades in arms, Colonel Roosevelt, in whose praise his last breath was spent, attended the funeral ceremonies.

The Cincinnati Inclined Plane Railway, of which Brent Arnold has been receiver and general manager, has been sold and transferred to C. H. Kilgour.



STREET RAILWAY ACCOUNTANTS' ASSOCIATION AT BOSTON.



## THE EXHIBITS.

The conditions were never more favorable for a fine exhibition of street railway apparatus and supplies than this year, and the suppliers responded by giving us the best display ever found at an A. S. R. A. convention. The space was ample; everyone was assigned all that he applied for, and hence there was not that crowding which has detracted from the appearance of the hall at former conventions.

The light, both by day and by night, was all that could be desired. Everything was under one roof, and the large basement space available reduced the number of outdoor exhibits, all the heavy apparatus cars, trucks, snow plows, etc., being shown there instead of outside the hall. Power was easily obtained, as it was at Niagara Falls.

There were but few exhibits in place on the morning of the first day, because of the holiday, Labor Day, making it difficult to get workmen and trucks to remove apparatus from the freight houses. But the exhibitors went to work early Tuesday morning, and it was really marvelous to note the change they had wrought in the appearance of the hall by noon. Before the day was over everything was in its proper place and very attractive the result was.

During the daytime only the wearers of buttons were admitted, and thus the halls were not crowded when the street railway men were on hand to inspect the displays. In the evenings the general public was admitted and thousands packed the halls.

The suppliers generally expressed themselves as well pleased with the attention that their exhibits received from the managers present, and we are advised of a number of large orders that were placed during the convention.

The Bureau of Information was a great convenience for everyone and greatly appreciated.

Swift's illuminated reversible signs were exhibited by W. H. Swift, the patentee, and B. T. Loudon. This device sets the signs on all parts of the car at once, and a dial in the roof at the motorman's head shows at a glance how they are set.

The Taylor Electric Truck Company, of Troy, N. Y., exhibited seven trucks. One single truck embodying the latest improvements and one single truck with extension truss for long open cars, both having 7-ft. wheel bases, illustrated the standards for single cars. The extra heavy 8-ft. wheel base truck is the one recommended for heavy cars and severe service. For double track cars two sets of trucks were shown: one pair were the regular "Empire State" radial trucks, and the other pair, recently designed swing motion trucks. John Taylor, manager; Robert Kasson, foreman, and Aubrey Tupper, of the office staff, represented the company and were kept very busy with the numerous callers at the Taylor exhibit.

The Barney & Smith Car Company, of Dayton, Ohio, exhibited three trucks for street railway service. These were the well known "Class G" single truck of 6 ft. 6 in. wheel base; the "Class H" double truck of 5 ft. 10 in. wheel base with 33-in. double plate wheels, and the "Class C" maximum traction truck, which has been in service for the last two years on numerous roads. This "Class C" truck has a wheel base of 4 ft.; the wheels are 33-in. and 18-in. Henry Tesseyman, mechanical engineer, and H. M. Esterbrook, assistant superintendent, represented the company, and they report that many calls and inquiries were received at the convention. Everyone who has used Barney & Smith products had only good to say of them.

The New York Switch & Crossing Company, of Hoboken, N. J., had on exhibition one of its automatic electric switches, which, to judge by the crowds present about the exhibit, was inspected by every one at the convention. The switch exhibited is for the Boston Elevated. Aside from this switch some pieces of chrome steel special work were shown; these were all made to order and were en route to the purchaser. W. C. Wood, president; Louis

E. Robert, secretary and A. H. Baldwin, superintendent, represented the company. The electric switch exhibited was the well known "dividend saver," which has been in use on several large eastern roads for some years, and was shown in operation at Niagara Falls, last year.

The Pantasote Company had an extremely attractive exhibit, where it displayed its latest patterns in curtain materials. Sample curtains were shown fitted with Forsyth fixtures, being mounted in handsome frames. The exhibit space was decorated with palms. This company has demonstrated that pantasote is the logical curtain fabric, and this is borne out by the list of orders taken during the last six months, it having supplied practically all the curtain fabrics for the street cars built this year. The list includes 350 open and 200 closed cars for the Metropolitan, of New York; 120 open and 110 closed cars for the Brooklyn Heights; 60 open and 120 combination cars for the Nassau road, of Brooklyn; 75 closed and 75 combination cars for the Baltimore Consolidated; 100 cars for the Chicago City; 75 cars for the North Chicago, and many others, including cars for the Baltimore City Passenger, the Metropolitan of Kansas City, the Norfolk, and the Kings County Elevated roads. John M. High, general agent, of New York, and H. N. Grier, Chicago representative, were at the convention. The two cars in the Brill exhibit, the standard Metropolitan and the new Brill convertible car, were both fitted with pantasote curtains. A pamphlet entitled "Pantasote" and telling the story of what one man learned about the many uses of pantasote from "a chance acquaintance" was a very clever souvenir, which every one fortunate enough to get one read with interest.

The exhibit of the Cleveland Frog & Crossing Company did not reach Boston in time to be displayed, but the company was represented by F. A. Lapham, who devoted himself to his many acquaintances among the railway men present.

The Rochester Car Wheel Works were represented by F. D. Russell, vice-president; George C. Morse, general sales agent, and A. A. Strickland, superintendent at New York, and had an attractive exhibit.

J. R. McCardell, of McCardell, West & Co., Trenton, N. J., attended the convention and exhibited one of their celebrated Trenton trolley wagons, which was inspected by all the electrical men not already familiar with its merits. Mr. McCardell took several orders while at the convention. These are the only trolley wagons now built.

The Ridgway Dynamo & Engine Company, of Ridgway, Pa., had planned to exhibit a 75-k. w. direct connected unit, but because of a delay on the railroad the machinery did not reach Boston in time for the A. S. R. A. convention. The company was represented by James L. Kimball, New England agent, and distributed illustrated pamphlets showing the U. S. naval vessels as souvenirs.

W. H. Bailey exhibited the Tonkin internally-fired water-tube boiler which attracted many visitors. He was assisted by Percy Allingham.

The exhibit of the Taunton Locomotive Manufacturing Company was in charge of W. R. Billings, treasurer of the company, and Messrs. Wendell and MacDuffie, selling agents. The company showed the heavy nose, the standard nose, and the double track share snow plows, representing the three types of Taunton plows which have proved so popular and effective. Two of these plows were sold on Tuesday, the first day of the convention; the double track share went to the Portland (Me.) City Railroad Company, and the heavy nose plow to the Worcester & Clinton road. A second double track share plow was

sold to the Manchester (N. H.) road. One of the most pleasing features to Mr. Billings was the spontaneous enthusiasm with which the employes of the Boston road recognized the double share plow as being like the one that did such good work on their road last year.

The exhibit of the Bemis Car Box Company, of Springfield, Mass., comprised two of its trucks, the standard motor truck for single truck cars and the No. 37 pivotal motor truck for double truck cars. The exhibit was in charge of George M. Hoadley, general manager, and Edw. N. Richards, superintendent, who met their old friends and made many new ones. During the week many orders were taken for trucks. The souvenir was a box of safety matches enclosed in a handsome aluminum guard bearing the legend, "A match for any truck."

The McGuire Manufacturing Company, of Chicago, exhibited the latest style "Columbia" solid steel truck, the "New Columbia" heaters and positive lock ratchet brake handles



THE MCGUIRE EXHIBIT.

without springs, and outside of the hall showed one of the McGuire combination snow plow and sweepers. All of these goods are well known as standing in the first rank. The company was represented by W. J. Cooke, vice-president, and M. G. Hubbard, engineer.

The R. Bliss Manufacturing Company, Pawtucket, R. I., showed the only car gate exhibited at the convention. The Wood platform gate is a combination of grab handle, hand rail and gate, and is used in all parts of the United States, and in foreign countries as well; two steam roads entering Boston have over 5,000 each. This gate has been adopted by the Boston Elevated for all cars entering the subway. The company was represented by N. H. Colwell, general manager, and Charles O. Hood.

The exhibit of the John Stephenson Company in the convention hall was a model of the cars built for the Metropolitan, of New York. This model was an exact reproduction of the regular

cars one-fourth size; it was mounted on a Peckham truck, equipped with Providence fenders, Sterling wheel guards and fare registers. The car was opposite the entrance to the General Electric globe and attracted much attention. It was in charge of Messrs. Vanderhorst, Howells, Hodges and H. Wood, the maker of the model.

J. W. Meaker, president of the Meaker Manufacturing Company, Chicago, represented his company and showed something new in fare registers as well as the older Meaker standards. The new registers have letters instead of figures on one or more of the wheels of the totalizer, thus making a record that only those knowing the cipher can read intelligently, thus enabling the manager to put a check on the bookkeeping as well as on the conductor. George Bean, vice-president of the company, was also at the convention assisting Mr. Meaker. The exhibit proved to be very attractive to street railway men.

George F. Sumner, president of the Knitted Mattress Company, exhibited a line of padding for car upholstery, etc.

The Pennsylvania Steel Company made an exhibit of its street railway special work. Charles S. Clark and W. C. Cuntz, Boston agents; Stephen W. Baldwin, New York agent; C. W. Reinhold, general agent, and Mason D. Pratt, chief engineer, represented the company.

The Watson-Stillman Company, New York, showed a line of hydraulic tools and jacks for use in street railway work. The company was represented by George L. Gillon, treasurer. Leather pocket books were the souvenirs.

Sherburne & Co., makers of railroad supplies, showed a very interesting line of track tools, construction cars, drills, etc. F. O. Nourse and C. H. Sherburne represented the firm, which is eastern agent for many well known machines and devices, among them the Q. & C. rail saws and drills, the Buda drills, the Watson-Stillman Company's hydraulic tools.

The Sampson Cordage Works, of Boston, displayed a case of its goods. Their specialty is rope and cordage for street railway use. F. J. Coakley represented the company at the convention.

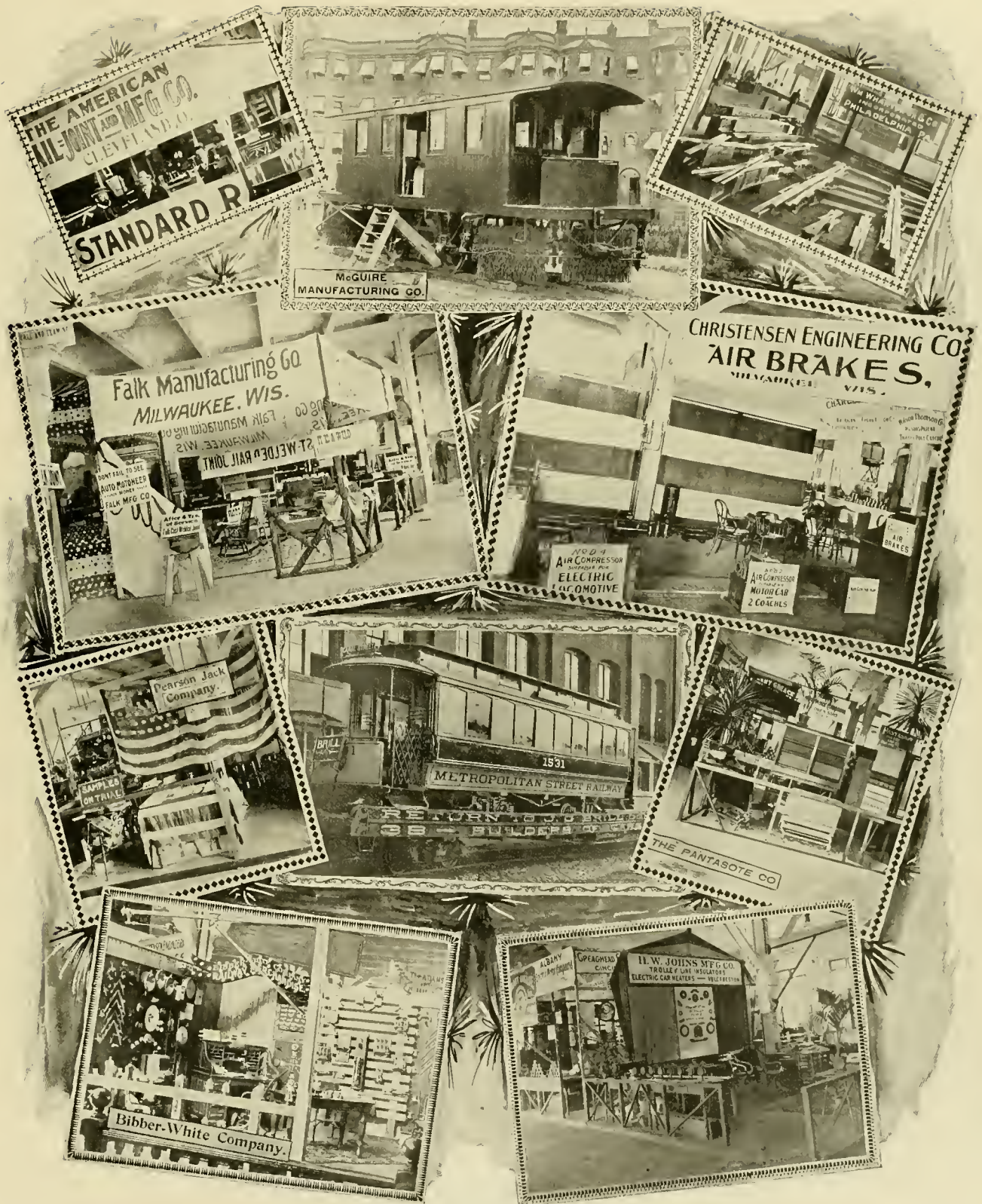
E. S. Netherent, engineer of the Paige Iron Works, of Chicago, had a desk in the convention hall and ably represented his company.

George A. Parmenter, maker of the Parmenter fenders and wheel guards, which have been adopted by the Metropolitan Railroad, the Capital Traction, and the Capital Railway companies, of Washington, D. C.; the Union Railroad, of Providence, and numerous other roads, was present in Boston. These devices have been illustrated in the REVIEW. The exhibit comprised a full-size model showing fender, wheel guards and track cleaner attached, and excited much interest among managers, especially those from cities where fender ordinances have been recently adopted.

Wm. Wharton, Jr. & Co. showed a number of frogs, switches and mates, and a general line of street railway manganese steel special work, the Wharton unbroken main line cross-over, the Pennsylvania Railroad three-rail crossing, etc. A new feature in the manufacture of special work is making frogs and mates entirely of manganese steel and to fit low T-rails; this manganese steel is so much harder that it will last years longer than any other material which has been used for this purpose up to the present time. The company was represented by Messrs. Wharton, Howe and Angerer and by Harrington, Robinson & Co., their New England agents; Mr. Robinson was in charge of the exhibit. During the convention over \$6,000 of orders were taken.

E. F. de Witt, of E. F. de Witt & Co., Lansingburgh, N. Y., exhibited the celebrated "common sense" sand boxes which are





used from Portland, Me., to Portland, Ore., and in foreign parts as well. Mr. de Witt has great numbers of the most flattering testimonials.

W. R. Evans, of Portland, Me., exhibited an improved car sign which attracted much attention.

Thayer & Co., Inc., exhibited some of the flanged steel headers and swinging man-hole plates which are features of the Cahall

boilers, for which they are agents. Aside from this the display consisted of photographs of some of the large installations of Cahall vertical and Cahall horizontal boilers, among which we noted those of the Lowell & Suburban Street Railway, the Carnegie Steel Company's Edgar Thomson Works, and the Lancaster Cotton Mills, of Clinton, Mass., all of which are very large and representative boiler plants. An interesting feature of the Carnegie plant is the use of a separate steel stack for each boiler, which makes the total cost of the stacks about equal to the in-



terest on the cost of single brick stack, and also gives uniform draft for all boilers. Winthrop Thayer, president, and George B. Clark represented Thayer & Co., Inc.

M. W. Greenwood, of Pittsburg, also represented the Cahall sales department.

The Heywood Brothers & Wakefield Company, of Boston, had a most attractive exhibit of the Henry car seats. Fred H. Henry was in charge of the exhibit, assisted by Clifford L. Lougee.

The Forsyth Brothers Company, of Chicago, exhibited car curtain materials, car curtains and curtain fixtures. It showed a revolving frame fitted with its well known curtains and roller-tip fixtures. A special feature which excited a great deal of favorable comment was a frame fitted with the company's new open street car fixture, which works on an entirely new principle from any heretofore used. The curtain does not depend on the frictionizing of a cable or tape, these being used simply to keep the curtain within the grooves; heavy springs force the solid ends of the guides into contact with the bottoms of the grooves, thus holding the curtains at any desired point. There is, therefore, no wearing, fraying or breaking of the cable or tape, it having no stress upon it, and the curtain is hence very durable. The company has increased the adjustability of its roller-tip curtain fixtures by a new mechanism so that they can now be applied to any variation in the different windows; leather or metal heads may be selected as desired. Geo. E. Pratt, the eastern representative, and W. H. Forsyth were present in the exhibit hall. Among other recent orders it reports the following: 102 cars for the Chicago City Railway Company, 80 cars for the Brooklyn Heights Railroad Company, 20 cars for the Cleveland City Railway Company, also the new cars for the Toledo Traction Company, Van Brunt & Erle Railroad Company, Ottawa Car Company.

The Pearson Jack Company was represented by A. H. Richardson, general manager, and T. Edward Tuttle who is in charge of the street railway department. The exhibit consisted principally of the company's latest improved device, the Pearson ratchet jack. The Pearson jacks are in successful operation on over 200 roads in the United States. A recent foreign order was for 64 jacks, which went to the road between Leghorn and Palermo; other foreign sales have been made in Moscow, Calro, Berlin, London, Calcutta and Mexico. The company will gladly send jacks on trial.

The Wagner Electric Manufacturing Company, of St. Louis, was represented by E. H. Abadie, manager of the sales department, and Henry M. Nay, New England sales agent. The exhibit comprised a number of instruments, transformers and switches, and a number of photographs.

One of the most attractive exhibits in the convention hall was that of the New Haven Fare Register Company. The exhibit comprised a full line of the New Haven single, double and triple registers, the company's new round register and the machine which has registered over 14,000,000 times without a break, which is fully equivalent to a century of hard service. Willis M. Anthony, president; F. C. Boyd, vice-president and general manager; John S. Bradley, secretary and treasurer, represented the company. The souvenirs of the New Haven company were combination paper cutters and letter scales which were much sought for, and like the paper cutters of last year will be found on many desks. In the evenings friends of the company were entertained at the Copley Square hotel where the handsomest suite in the house had been engaged.

The H. W. Johns Company exhibited three lines of street railway goods, the "vulcabeston" insulating parts for all standard motors and controllers, a line of the H. W. J. heaters and regulating switches, and several layouts of overhead line materials. The all-steel flexible trolley bracket, just put on the market attracted a great deal of attention from visiting managers. At the convention were A. Hall Berry, manager of the electrical de-

partment; J. E. and S. G. Meek; D. T. Dixon and J. W. Perry, of Philadelphia; E. B. Hatch and H. H. Luseomb, of Hartford, and H. C. Spaulding, of Boston, who has charge of the electrical department for New England.

The Ham Sand Box Company, Troy, N. Y., exhibited its No. 3 box which was shown last year, also the No. 4, the new type which was recently described in the REVIEW, both of which attracted a great deal of notice. A. M. Wight, secretary and treasurer, was in charge. Many orders were taken during the convention and numerous compliments received from those who had given the boxes trials. Mr. Moore, of the Chicago City Railway, did not hesitate to express his satisfaction with these boxes, which that road has adopted as standard. Great numbers of the motormen on the Boston roads who examined the exhibit, wished that their cars might be equipped thus instead of with the pails and shovels now provided.

Dr. J. M. Griffin, president of the Wheel Truing Brake Shoe Company, maker of composite wheel grinding shoes, Detroit, Mich., represented his company and showed samples of the shoes.

John E. Welsh, special agent of the Mason Safety Tread Company, 40 Water street, Boston, exhibited the unwearable, non-slipping treads for street car steps. The Mason tread is in general use in Boston, and Mr. Welsh had a unique experience in that he took a sample order from almost every railway manager who saw the exhibit. This is a remarkable record but justified by the goods.

A. O. Norton, of Boston, exhibited a full line of his well-known street car and track jacks.

C. D. Holman, represented the Methuen Electrical Company, of Methuen, Mass., and exhibited a water-proof, almost indestructible rubber sleeve for insulating motor connections, which does away with taping such joints, and is cheaper than the tape.

J. P. McMahon, treasurer of the Rochester Hose Bridge Company, exhibited one of the Rochester bridges, which all of our readers who were at Niagara Falls will remember having seen in service there.

The exhibit of the Du Quesne Forge Company, Pittsburg, Pa., was in charge of D. S. Bissell, president, assisted by J. N. Parsons and J. B. Van Wagener. These gears which were fully described in recent issues of the REVIEW, have proved very popular and in the last year have been put on 40 different roads throughout the country.

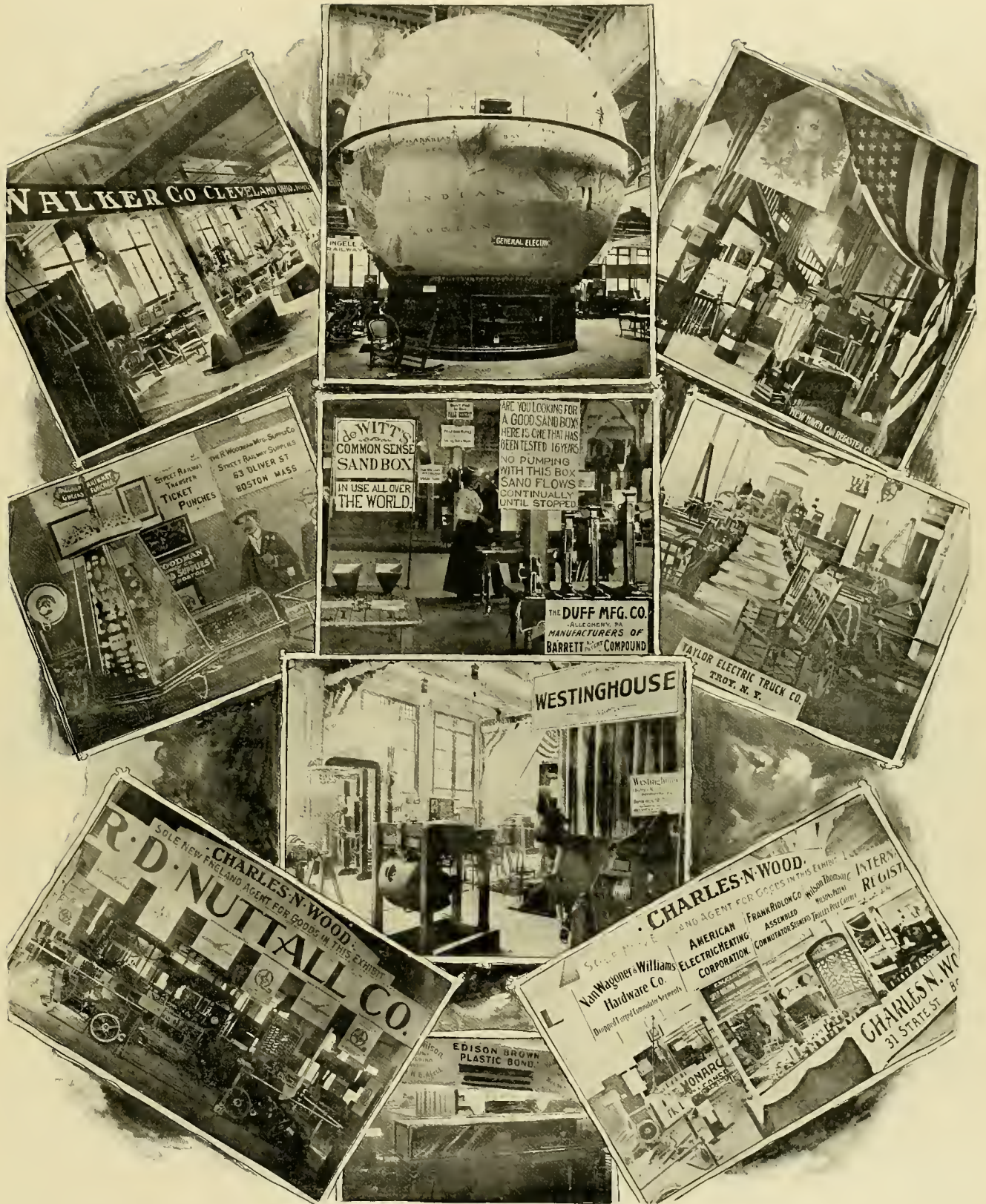
J. B. Van Wagener exhibited the Bryan bond now in general use in Pittsburg.

The Crosby Steam Gage & Valve Company exhibited a full line of gages, valves and indicators, which being artistically displayed, made his booth very handsome. The company was represented by Robert Pirlle, S. G. Reed and Charles M. Gibbs.

The Shawmut Fuse Wire Company showed a line of enclosed fuses and switches, which was in charge of H. P. Moore and B. S. Luther. These fuses will be remembered by many as having been a feature of the Niagara Falls convention; they have proved very popular for car heating work for which they are especially designed.

L. C. Chase & Co., selling agents for the Sanford Mills, of Sanford, Me., had a most attractive exhibit and displayed a very complete line of plush goods for all kinds of cars. The exhibit was in charge of George Goodall, of Sanford, assisted by Frank B. Hopewell, of L. C. Chase & Co. Goods for all purposes and qualities were displayed. This company will furnish the plush for the Boston Elevated cars.





The Christensen Engineering Company, of Milwaukee, had an extensive exhibit which comprised a No. 1 independent motor-compressor of a capacity of 11 cu. ft. of free air per minute, operating through a straight air engineer's valve, a 7-in. brake cylinder; one No. 2 independent motor-compressor of 20 cu. ft. capacity, operating, through a straight air engineer's valve, three 7-in. brake cylinders; one No. 4 independent motor-compressor

of 46.7 cu. ft. capacity, operating, through automatic engineer's valve, two 10-in. brake cylinders; all of these were controlled by automatic switch controllers. The company was represented by N. A. Christensen, Frank C. Randall, W. J. Davison and S. W. Watkins. For a souvenir it had a very artistic, illustrated, pamphlet showing the year's business; it included a number of the most flattering testimonials from roads using these brakes on



all types of locomotives and cars. The brakes were used on the special excursion trains at Nantasket Beach

The American Rail Joint Company was represented at Boston by W. E. Ludlow, general manager, and T. V. Church, of Julian L. Yale & Co., Chicago agents. This joint is meeting with a great deal of favor for an article so recently put on the market and the exhibit space was always crowded with visiting managers.

T. V. Church, of Julian L. Yale & Co. Chicago, represented the Allen & Morrison Brake Shoe Company with an exhibit of its composite brake shoes which have seen service. Very handsome memorandum books were distributed as souvenirs.

James N. Richards and Charles Earnshaw attended the convention in the interest of the P. & B. products of the Standard Paint Company, of 81 and 83 John street, New York. This company made no exhibit other than such of its products as were shown in other spaces, but, thanks to its representatives there, the P. & B. interests were well taken care of. One of the most useful souvenirs of the convention was the P. & B. bill book, a standard with the Standard Paint Company, and we venture to predict that they will prove to be just as good stayers as the commercial P. & B.

The Walker Company, of Cleveland, made an elaborate showing of street railway apparatus for surface, elevated and conduit railways. The details of construction of the new 25-h. p., 33-S type of motor were shown by an exhibit of parts of the motor in its various stages of development. The thorough protection of the conductors and the effective means for ventilating the armature received favorable comment. Two 75-h. p. motors were shown of the type adopted for the Brooklyn elevated. These motors from their extraordinary size and massive construction seem entirely capable of performing the arduous duties demanded of them. Their commutators were noteworthy for the number and depth of the segments. A line exhibit of the Love conduit railway was made on 60 ft. of track set up for inspection. A Peckham special Metropolitan railway truck upon which Walker motors were mounted ran upon Johnson rails. The plow and insulators of the Love conduit system, which is now under the control of the Walker Company, were also shown separately. The object of greatest interest was the solenoid blow-out controller which operated both practically and in an experimental model form. The celerity and effectiveness with which the arcs, usually so destructive to the contacts, were eliminated was a cause for amazement to those who had not seen it before. A large number of Walker low tension enclosed arc lamps and a railway switch-board, made up of one generator and two feeder panels, completed the exhibit. To J. S. Anthony, advertising agent of the company, was due the greater part of the credit for making the booth so attractive. H. L. Harding, manager of the sales department, C. N. Black, superintendent of the New Haven factory, M. D. Law, J. N. Dodd, T. Zweigber, C. A. Barton, of Cleveland, H. G. Issertel and F. W. Sawyer, of Boston, John D. Moore, of New York, R. A. Byrns, of Buffalo, H. B. Gay, of Baltimore, W. G. Bain, of Philadelphia, E. K. Noyes, H. W. Hobbs, G. D. Smmons, T. C. Hawks and H. Harding were representatives of the company.

A. G. Hathaway, of Cleveland, is responsible for that useful souvenir seen in so many hands at Boston: the pack of cards which included the program, a memorandum of the points of interest and the business cards of 12 prominent street railway supply houses of Cleveland. Mr. Hathaway himself was playing a 10 to 1 shot on Campbell & Zell boilers and Santiago bankers.

Parlor G at the Brunswick was occupied by the J. G. Brill Company where its handsome truck models were on exhibition, and where a royal welcome and entertainment were furnished.

The Garton-Daniels Electric Company, of Keokuk, Ia., was represented at the convention by J. V. E. Titus, secretary of the

company. The company had no exhibit of its own but Garton arrangers were to be seen in the exhibits of the Ohio Brass Company, Elmer P. Morris and Pettingell, Andrews & Co.

The American Brake Shoe Company was represented by F. W. Sargent and two of its lessees, the Sargent Company, of Chicago, and the Ramapo Iron Works, of Hillburn, N. J., who exhibited the "Diamond D" brake shoes in connection with Dilworth, Porter & Co., Pittsburg, makers of steel car axles, the Continuous Rail Joint Company, Newark, N. J., and J. H. Sternbergh & Son, Reading, Pa. William F. Ellis is the New England agent for these firms. The souvenirs of the Ramapo Iron Works were nail nippers.

The Consolidated Car-Heating Company, of Albany, N. Y., was represented by J. F. McElroy, consulting engineer, R. P. Seales, H. N. Ransom and W. P. Cosper. The exhibit included a set of six heaters (the number usually placed in a car) properly connected but with the heating coils replaced by incandescent lamps so as to make apparent to the eye the different intensities of heat obtained by manipulating the heater switch. A feature very interesting to managers was made by connecting two heaters which have been in use in street cars since 1893, in series with two of the latest make. Measuring instruments showed the old ones to be as efficient as ever, refuting the statement sometimes heard that the heating coils deteriorate with use. The new lock switches were also shown. The company to date has sold nearly 34,000 heaters; in June, 1893, there were but 360 in use.

J. Hinekey Williams, 34 Wrentham street, Ashmont, Boston, exhibited the Williams truss rail joint

John D. Reed, the inventor, and H. Gore & Co., agents, represented the John D. Reed all metal construction for railways, exhibited models and drawings.

The John F. Ohmer Register Company, of Dayton, exhibited its multiplicity fare register which keeps a separate record for each conductor and gives the company a printed classified statement of the various fares collected, the conductor having no reports to make. Mr. Ohmer and an assistant were in charge.

The Gold Street Car Heating Company was represented by Edward E. Gold, John E. Ward, Frederick Weston, E. H. Moss-grove and H. E. Beach, and exhibited its new style electric heaters, consisting of the Gold improved resisting coil and support.

N. C. Keeran, Chicago city passenger and ticket agent of the Wabash Line, "personally conducted" the Wabash special which carried 65 of the western street railway people to Boston. He remained throughout the convention and escorted another large party back on Friday night

Charles N. Wood had an extensive exhibit, being the sole New England agent for the R. D. Nuttall Company, the Van Wagner & Williams Hardware Company, the American Electrical Heating Corporation, the Frank Ridlon Company, Wilson, Thomas & Co. and the International Register Company. F. C. Waddell assisted Mr. Wood.

F. A. Estep, president and treasurer of the R. D. Nuttall Company, and George W. Provost, of the home office, were attendants at the convention and were to be found at the very handsome and complete exhibit of their gears, pinion, trolleys and bearings in the space of C. N. Wood.

The International Register Company, of Chicago, had a very complete and artistically arranged exhibit of its different types of registers at the space of C. N. Wood. A. H. Woodward, president of the company, and W. H. Brown were in charge.



The "Monarch" track cleaner, made by the Monarch Stove & Manufacturing Company, of Mansfield, O., which has met with such flattering success ever since its introduction to the trade, was exhibited by C. N. Wood.

A. C. Woodruff, general manager of the Consolidated Car Fender Company, of Providence, A. C. Woodruff, Jr., superintendent, and George H. Hale, general agent, represented that company and were to be found at the very attractive exhibit at space No. 246. The exhibit comprised a complete assortment of the different fender parts and a platform equipped with three Providence fenders, finished in different styles. These fenders are perhaps the best known of any there being over 6,000 in use in 70 cities and towns. For a souvenir there was the well with the old oaken bucket, which when drawn out proved to be filled with philosophical reflections, and reasons why car companies should use Providence fenders.

A. C. Vosburgh, secretary and treasurer of the New Process Raw Hide Company, of Syracuse, was at Boston representing that company and renewing his acquaintance with the street railway men. The souvenir of the company was a combined match box and cigar cutter. The raw hide pinions are now such well known specialties that an exhibit is a useless expense.

Elmer P. Morris, of 15 Cortlandt street, New York, made a dis-

globe from all points of view he failed to find one from which he could not see places where the plastic bonds were used. James Hollowood, superintendent, and Charles H. Wilson, New England agent, assisted Mr. Brown at the exhibit hall. One of his souvenirs was a bond of the Up-to-date Street Railway.

Albert B. Herrick exhibited one of his portable testing sets for ear inspection. At Niagara Falls last year Mr. Herrick had a testing switchboard which will be well remembered. The present set is portable and has been greatly improved. This system of inspection is being widely adopted, 26 roads having ordered them. The one shown at Boston was the second one ordered by the Union Traction Company, of Philadelphia.

F. H. Newcomb, 13 Astor place, New York, showed a full line of uniform caps. The exhibit was in charge of F. H. Newcomb and H. H. Boerum.

The Rooke Register Company, of Peoria, Ill., was represented by George F. Rooke, treasurer and manager, Albert W. Jamison and A. N. Loper. Probably none of the devices exhibited were examined with greater interest than this fare register which records the money before it passes into the possession of the conductor. Lead pencils were distributed for souvenirs.

W. T. Van Dorn, of Chicago, represented his company and ex-



VIEWS OF THE EXHIBIT OF ELMER P. MORRIS.

play occupying 1,100 sq. ft. of space in the main hall, and was ably assisted by C. T. Harrington. Mr. Morris exhibited the products of the following companies whose representatives were also at the convention: Keystone Electric Company, representative, J. T. Stevens; Ajax Metal Company, George Pratt; Railway Equipment Company, George Wick; Kosmic Filter Company, H. P. Hess; Pittsburg Steel Trolley Plate Company, Samuel Maver; Sterling Arc Lamp Company, Robert Randolph; Forest City Electric Works, John Dolph; Partridge Carbon Company, J. S. Speer; Harrington Rail Bond Company, S. H. Harrington; Garton-Daniels Electric Company, J. V. E. Titus; also the Wheeler Reflector Company, McGuire Manufacturing Company, Harrington Illuminated Sign Company, Point Marion Manufacturing Company, Forsyth Brothers Company, Hope Electric Appliance Company, and agent for the "Monarch" insulating paint. The X-ray booth, otherwise known as the "Morgue," attracted a great deal of attention and the many visitors each carried away a souvenir glass upon which was cut the trade mark of the Partridge Carbon Company. All the exhibits were sold before the convention closed.

Harold P. Brown, of 122 Liberty street, New York, occupied space immediately opposite the REVIEW headquarters, and exhibited the standard plastic rail bond, which is now so well known that little new can be said of it. Some interesting features were some joints which had been in service for several years. The hand power grinder used for cleaning the rails was also shown. Mr. Brown states that in examining the General Electric

hibited aluminum models of the Van Dorn couplers and a book of prints showing nine sizes and types of couplers.

The Falk Manufacturing Company, of Milwaukee, had at its space in the convention hall a collection of Falk cast-welded joints, which have been in service, and they proved to be one of the most interesting exhibits for the track men. Among these were two taken from the Clark street line of the Chicago City Railway, being relaid at this time to avoid interruptions in the future; in forwarding these joints the company expressed its entire satisfaction with the service; the joints were selected at random and are in perfect condition. E. A. Wurster, secretary and treasurer; Clement E. Smith, superintendent, and Henry L. Prather represented the company.

The Creaghead Engineering Company, of Cincinnati, made a very complete display of its well known "flexible brackets." These brackets have become standard for high speed roads throughout this country and abroad, and their universal popularity is attested by the many thousands in daily use. Great care has been given the manufacture of these brackets, the arms being made of a special steel constructed to withstand about double the strain of ordinary gas pipe, and all the fittings are made of high grade wrought and malleable iron, making a bracket that will withstand the most severe strains without damage. This exhibit also included a full line of overhead material, line insulators, curve pull-overs, insulated crossings, section insulators, strain insulators and a very complete exhibit of malleable iron

pole fittings, pole tops, collars, bands, cross arm clamps, cross arms, etc. The display was very nicely arranged and handsomely decorated, and was in charge of the superintendent, G. R. Scrugham. The company's souvenir was a neat steel pocket rule in a leather case and was much sought after.

The Ashton Valve Company, of Boston, New York, Chicago and London, exhibited a complete line of safety valves, relief valves and pressure and vacuum gages. The exhibit was in charge of Albert C. Ashton, secretary and treasurer, H. H. Ashton and C. W. Houghton.

The Corning Brake Shoe Company was represented by Francis Granger and H. T. Mereur, and exhibited a number of special brake shoes. Among them were two "maximum traction shoes," the large one for inside hung brakes and the small one interchangeable, doing away with rights and lefts. Extra long shoes with a high coefficient, special shoes with deep flanges, and the standard shoe of the Manhattan Elevated, New York, were also shown. The company states that its business has increased tenfold in the last year. The souvenirs of this company were callipers which were much sought after.

Adam Cook's Sons, of 313 West street, New York, were represented by M. V. Peavey, its New England agent, and showed the celebrated "Albany" grease and the "Albany" electric motor compound.

The exhibit of the Albert & J. M. Anderson Manufacturing Company, of Boston, comprised a line of insulators, lamps, special brass goods, etc., and was in charge of C. B. Pear. Switches constitute a specialty of this company but because of the works being so crowded with orders for switches, there was not time to prepare any for exhibition in the convention hall, the company feeling that those in use in the various power houses in Boston would suffice. Pocket memorandum books made very attractive souvenirs.

The Bibber-White Company was represented by C. E. Bibber, president; T. H. Bibber, David W. Dunn, E. L. Brown, and H. W. Smith, manager of the railway department. The line material made by this company was shown in black enameled iron, galvanized iron, bronze, and glass "agatized" material, last being entirely new. In addition to the line material, headlights and bracket arms, made by the company, the exhibit included New Haven fare registers and Hope Electric Appliance Company switches. The Bibber-White Company handles all kinds of railway merchandise, and will have built before the snow flies some 150 miles of track this season. The souvenirs were miniatures of the corrugated trolley poles recently placed on the market, designed to serve as pen holders. A phonograph was an attractive feature at this exhibit.

The Billings & Spencer Company was represented by H. E. Billings and W. B. Post. The exhibit comprised samples of commutator segments, some 200 in number, including the largest segment ever drop-forged, some drop-forgings for Lundell motors and line material. Key rings were distributed as souvenirs. The Billings & Spencer Company has just issued a new illustrated catalog showing two hundred or more commutator segments made by it for all types of stationary machines.

Walter N. Dole, manager, and A. E. Prince, assistant treasurer, represented the Boston Artificial Leather Company, which had a most attractive exhibit of "Moroccoline," its upholstering substitute for leather. This material is attractive in appearance, cleanly, cheap and durable. Moroccoline pocket books were distributed as souvenirs.

One of the most attractive and artistically arranged exhibits in the hall was that of the Charles Scott Spring Company, which was represented by H. C. Johnston and D. S. Roche. No attempt

was made to show a full line of the Scott springs because that would be impossible outside of a warehouse, but a few car springs, trolley springs, etc., were artistically displayed. The railing was in keeping with the times, being formed of red, white and blue trolley springs. The souvenirs distributed were those the company have found to be so popular at past conventions, leather covered memorandum books. Many of the company's friends called in response to the engraved cards which had been sent out, and all were handsomely entertained by Messrs. Johnston and Roche.

The Sterling Supply & Manufacturing Company, of New York, was represented by Frank A. Morrell, who represents the company in the east, and L. D. Nelson, who has the western territory. The exhibit, which was one of the most sought in the hall, included the No. 1 double register, just put upon the market, which registers the cash fares and transfers and totalizes each separately and yet is worked by only one rod or cord. Among the other materials shown were samples of overhead line material, drop-forged commutator segments, the "Sterling" sand box, the "Sterling" fenders adopted by the Metropolitan Street Railway, of New York, special brackets for registers, six different styles of registers, etc. Last year the Sterling Company had the best souvenir of the Niagara Falls convention, and this year its souvenir was a sterling silver lead pencil in the shape of a 13 in. gun which will hold the record for 1898. A souvenir equally as acceptable was the handsome new catalog given to each visitor. It is handsomely printed on fine paper with a flexible cloth back. The Sterling fare registers, safety brake, fender, sand box, suspensions, insulators, counters, wire measurer, winding machine and badges are all illustrated and described.

J. P. Sjöberg & Co., of New York, manufacturers of street car wood work, were represented by W. J. Walker, who exhibited a model of a car window at the space of the Sterling Supply & Manufacturing Company.

The Hipwood-Barrett Car & Vehicle Company exhibited its car fender and showed the working by models; the exhibit was in charge of George Hipwood and J. W. Barrett. During the convention these fenders were in use on the Newton & Boston road and tested at Newton.

The Standard Underground Cable Company, of Pittsburg, had an exhibit at the convention which was in charge of T. E. Hughes, manager of the Philadelphia office, and G. L. Wiley of the New York office. Frank A. Rinehart, treasurer of the company, with his wife also attended the convention. The exhibit included samples of every kind of electric light, power, street railway and telephone cables. The company has just completed the largest contract for cables ever let for street railway cables—\$950,000 worth for the Union Traction Company, of Philadelphia. Lead-covered telephone cables have also been a specialty. Sections of power cables of suitable size for paper weights were its convention souvenirs; copies of the "Electrician's Handbook of Useful Information" were also distributed and will be found to be all that the name implies. This company is running 24 hours per day and is behind with orders. Work now on hand includes three of the largest telephone plants now being erected, two at St. Louis and one at Indianapolis; they call, in the aggregate, for over \$250,000 worth of telephone cables.

The Baltimore Car Wheel Company showed both its single and double trucks, the exhibit being in charge of J. Paul Baker, secretary of the company, and A. E. Baker. Very handsome lithographs in several colors were distributed showing the famous "Lord Baltimore" single truck and the coat of arms of the early Maryland proprietor. The picture is on a heavy card, 11x16 in., with a red, white and blue ribbon for a suspension. It would be an ornament in any office. The trucks are constructed entirely of steel and are simple, durable and strong. The Lord Baltimore double center bearing truck has proven as successful in service as has the single truck, and is built upon the same lines.





The R. Woodman Manufacturing & Supply Company, which has over 3,000 of its ticket punches in use on the Boston Elevated lines, had a full line of punches, seals, speed indicators, punching and numbering machines, office stamps, buttons, badges, etc., on exhibition. R. Woodman and T. W. Wardley were at the convention representing the company.

W. H. Russell represented the Russell Manufacturing Company, Watertown, Mass., and exhibited its curve taking trolley harp, and its special overhead crossing.

The Massachusetts Mohair Plush Company, of Boston, had an interesting exhibit.



The Columbia Machine Works, Buchler & Platt, of New York, had an extensive exhibit of commutators, drop-forged copper bars, trolley wheels, bearings, fuse boxes, car trimmings, adjustable brake and controller handles, etc., which had many visitors. All the commutators shown were sold during the convention. The firm was represented by Mr. Buehler, James Grady, superintendent, and W. R. Kerschner.

R. S. Bishop, of the Bethlehem Foundry & Machine Company, attended the convention in the interest of the Moyer trolley base which was shown in the Columbia Machine Works exhibit.

The Coleman Farebox Company, of Tottenham, Ont., exhibited its boxes for collecting street railway fares. J. H. Coleman was in charge and took pleasure in explaining the working of the apparatus.

The Pottier & Stymus Company, maker of ear seats, was represented by F. C. McLewee. The Brill Company has purchased 1,050 of these seats within the last 30 days.

The Churchill rail joint, for all sizes and patterns of T and girder rails, which is made by the Diamond State Iron Company, Wilmington, Del., was shown in charge of H. T. Wallace, secretary of the company. Forty miles of Boston track are laid with these joints.

E. H. Morgan, successor to W. H. Kilbourn & Morgan, Greenfield, Mass., exhibited the Kilbourn sand feeder, which is recommended by the roads using it as reliable and always ready for use.

An exhibit which attracted considerable attention was that of the Incandescent Electric Light Manipulator & Cleaner Company, which makes tools for handling and cleaning lamps which are so placed as to be otherwise inaccessible save by using long ladders or heavy chairs. Joseph J. Dunn, manager, was in charge.

The Lyte Steel & Lead Woven Tread, of 3 Hamilton place, Boston, was represented by W. M. Evatt, who exhibited samples.

The Wm. H. Gallison Company, 36 Oliver street, Boston, engineers and contractors for steam piping, had an interesting exhibit.

The American Wheelock Engine Company exhibited a full size valve plug and valve, which was in charge of C. C. Hardy.

D. C. Sweet, of Springfield, Mass., had one of the well-known Sweet car-wheel grinding machines on exhibition in the basement.

Wadsworth, Howland & Co., Boston, had a most attractive display of paints, varnishes and painters' supplies. The exhibit was in charge of Frederic A. Gunnison and H. A. Putnam.

The Hampden Corundum Wheel Company, of Brightwood, Mass., had a very interesting exhibit, one of its improved car wheel grinders, which was in charge of Charles Nicholson, it attracted a great deal of attention. This grinder is a very complete machine, with all manner of devices for close adjustments; it is placed in the car pit and the wheels are trued without removing them from the car.

The Pennsylvania Car Wheel Company exhibited a number of its standard and special wheels for street railway service; among them the 33-in. and 30-in. motor car wheels and 28-in. and 24-in. trail car wheels. James D. Rhodes represented the company.

George Weston, manager of the construction department for Naugle, Holcomb & Co., the well-known firm of railway contractors, and dealers in ties, poles, etc., represented that firm at the convention. Mr. Weston was ubiquitous and distributed leather

covered memorandum books which contained the convention programs, list of officers, committees, etc., and other data which the delegates found quite useful.

The Cambria Iron Company, of Philadelphia and Johnstown, had headquarters in the convention hall and displayed a full line of sections of rails from 8 lbs. to 107 lbs. per yard, and of all types. W. A. Washburn, sales agent, 33 Wall street, New York, was in charge.

The Standard Air Brake Company made no exhibit in the hall but showed its brakes in service on the cars of the Commonwealth Avenue Street Railway Company, over whose lines the trip to Norumbega Park was made. During the ride to the Park, Friday afternoon, the writer heard a number of complimentary remarks as to the manner in which the cars were braked. At the Park representatives of the Standard Air Brake Company were in attendance to explain the mechanism in detail and were kept busy, as there were many managers present who contemplate adopting air brakes as soon as the financial condition of their companies will permit it, and they took this opportunity of seeing how the brakes worked in practice.

One of the most acceptable souvenirs of the convention was a booklet prepared by A. L. Reich and entitled "The General Electric Company at Boston." It is most artistic in make-up and is filled from cover to cover with handy information for the visitor at the "Hub" and profusely illustrated. The power houses of the Boston Elevated, the Lynn & Boston and the Lowell & Suburban, Nantasket Beach roads are all described, and a brief account is given of the Lynn factories of the company. The principal points of historic interest in and about Boston, location and means of getting to the pleasure resorts, theaters, ferries, steamboat lines, etc., are described in a terse and lucid manner.

The Joseph Dixon Crucible Company, Jersey City, N. J., was represented at the Boston convention by George E. Long, secretary, and John H. Baird, A. L. Haasis and E. A. St. John, salesmen. The exhibit in the hall was visited by everybody, and all who sampled the souvenir lubricants provided were in accord as to the excellence of the Dixon products. On exhibition were samples of the Dixon lubricants. "Graphited wood grease" is for gears; in a very short time after it is applied, it loses its original granular character and assumes a peculiar tough, spongy consistency, very adhesive and of excellent body. This body is due to the fibre of the wood, which is now in a very fine condition. The method of application is ordinarily to put enough inside the gear cases, so that one of the gears may drag through it. Employed in this way, the grease is exceedingly durable, and reduces the labor of application to a minimum. Flake graphite (No. 635) is a lubricant for raw hide pinions. The name of "graphited curve and track lubricant" explains itself. The best dressings, paints, etc., made by the company were also shown. Pencils were the company's souvenirs.

J. H. Van Dorn, of the Van Dorn & Dutton Company, Cleveland, was at Boston during the convention meeting his many friends and extending his acquaintance.

H. F. J. Porter represented the Bethlehem Iron Company, South Bethlehem, Pa., at the convention. Mr. Porter's headquarters were at the Hotel Brunswick in parlor 18, where he kept open house and entertained all his friends. He had an interesting collection of photographs showing some of the work turned out from that forge.

The Vacuum Oil Company was represented by E. A. Record and exhibited samples of oil and lubricants

The Lawton "Peerless" fender was shown by John C. Curtis, agent for the patentee. Mr. Curtis, whose office when at home is 1218 Masonic Temple, Chicago, was kept busy showing the exhibit. Col. Lawton, the inventor, was also at the convention.





"The "Auto-Motoneer," illustrated and described in another column, was delayed in transit and could not be placed on exhibition until Friday afternoon, much to the chagrin of G. W. Knox, the patentee, and C. E. Moore, who were among the delegates from the Chicago City Railway. When the apparatus did arrive, however, it attracted the keenest interest, and many favorable comments were made by the railway men who saw it.

John George, who is handling the apparatus, took it down to the New York State Association meeting the following week.

G. E. Stanley and J. E. Miles attended the convention and exhibited the Stanley & Miles emergency brake, which is stated to have great power, to be easily adapted to all cars, to be simple in construction, inexpensive and can be instantly applied.



The E. T. Burrowes Company, of Portland, Maine, had a very complete exhibit of the Burrowes patent car shades. The Burrowes Company is the pioneer coach curtain maker and the inventor of the spring actuated curtain holding device which is so universally used. The different styles of curtains were shown in a large revolving mahogany model and the display was most attractive and interesting. The curtains, as shown this year, embrace many radical improvements and desirable modifications, among the later designs of holding mechanisms being the No. 83, the "Royal" and the "Climax" styles. For the particular conditions for which these three mechanisms were devised, they show the highest attainment and greatest perfection to date in curtains. The "Climax" fixture is more easily operated and the wire will not bulge out of the groove (a sad objection to the old style), as children and even older people could not always resist the temptation to tamper and play with the wire thus exposed. This style of mechanism is, perhaps, not as popular as the spring or pinch

ears; the triple enshioned swing bolster double truck No. 14 A, for high speed interurban and elevated electric railway service; the extra strong No. 14 A for extra heavy service; the short wheel base swing bolster double truck No. 14 B, particularly adapted for short radius curves; the center bearing, swing bolster, maximum traction trucks, No. 14 D2, as constructed for G.-E. 1,000 motors, designed for high speed closed or open cars using only one motor; and the 14 D3 of the same style as the 14 D2, but made for extra heavy cars. These last two trucks were designed to overcome the objections existing in maximum traction trucks constructed with side bearings and do away with the necessity of applying a portion of the weight of the car body to the small wheels, to prevent their jumping the track. The center bearing swing bolster relieves all side strain; placing the motor outside the axle permits the bolster to be nearer the driving axle and increases the load available for traction by from 7 to 10 per cent, according to the weight of the motor; the segmental

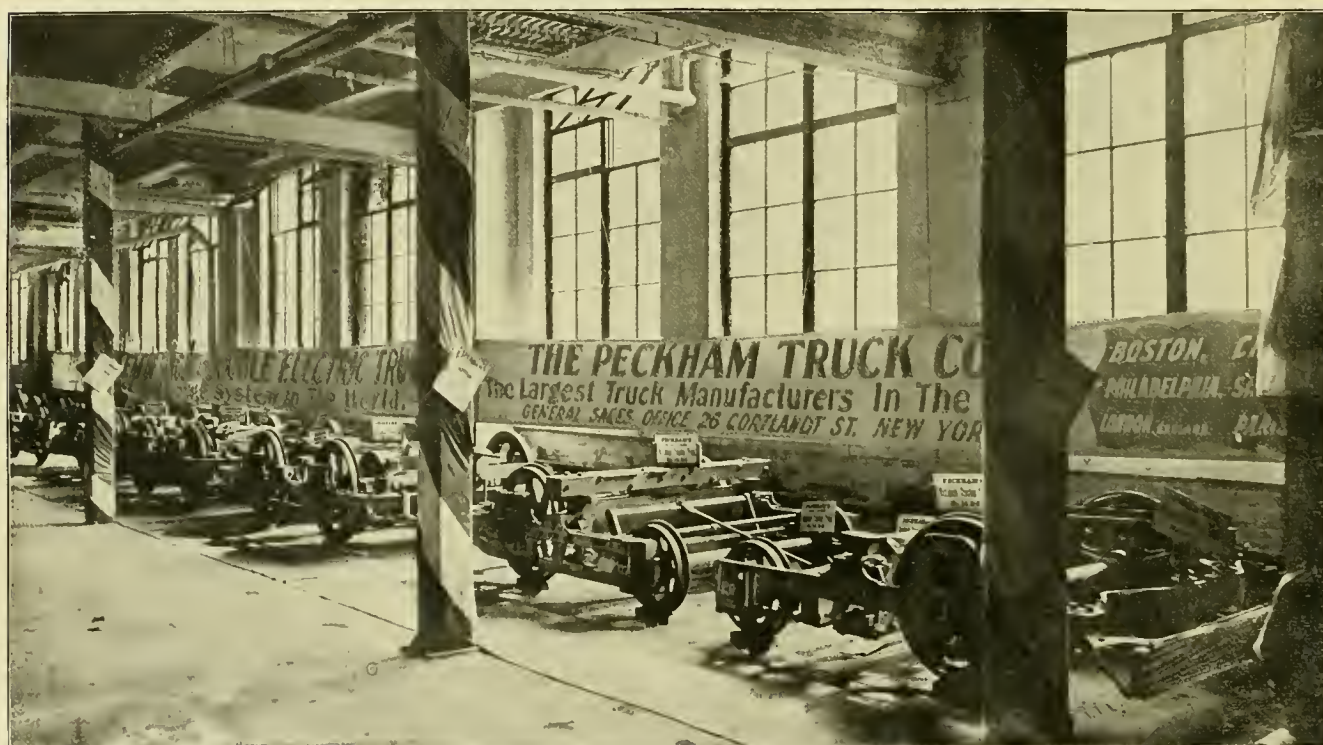


EXHIBIT OF THE PECKHAM TRUCK COMPANY.

handle device, but it too has its friends and is used to a considerable extent. A picture showing the three large well appointed factories of the Burrowes Company, located at Portland, Me., indicating a prosperous business, together with a large line of curtain materials, made up the balance of the exhibit which attracted a great deal of attention. H. H. Russell and E. A. Baker represented the company.

The Peckham Truck Company occupied 1,500 sq. ft. in the convention hall and exhibited Peckham's system of single and double trucks, which includes trucks adapted to any and all conditions of electric service, from light, short to long, heavy closed and open cars, as well as extra strong trucks for freight, switching and locomotive service. The trucks shown in the Peckham exhibit were nine in number and comprised the 7 D "Excelsior" single truck for 16 to 20-ft. closed and 26 to 30-ft. open cars; the "Cincinnati special," extra strong "Excelsior" designed for extra heavy cars and severe service, it has M. C. B. journal boxes; the standard S A as constructed for 16, 18 and 20-ft. closed cars, and especially adapted for high speed and double-deck cars; the extra long "Broadway" standard No. 9 A, designed for 20 and 22-ft.

swivel plates used in this truck may be adjusted so as to give any desired swing to the truck.

In addition to these one of the Peckham trucks was shown in the exhibit of the Walker Company, and Peckham trucks were used under the car in the Safety Third Rail Company's exhibit and under the Stephenson model.

At the Hotel Brunswick Peckham headquarters were in Partor K, where Mr. Peckham's handsome models were to be seen and visitors entertained. Representing the company at Boston were E. Peckham, president; E. G. Long, vice-president; A. W. Field, eastern agent; J. A. Hanna and W. H. Gray, of the western office; and several representatives from the New York office. The Peckham souvenirs were beautiful gold-mounted white leather card cases with memorandum books for the ladies, and puzzle purses for men.

The Beverly Machine Works, Beverly, Mass., were represented by John S. Baker, proprietor, and W. E. Bailey, superintendent. The exhibit comprised the Beverly ratchet clutch brake handle and the Beverly ratchet clutch vertical brake wheel, both of which are well-known devices.



Gus. Suekow, manager of the Vose Spring Company, New York, attended the convention. He reported his company as being full of orders.

Charles Blizard, manager of the New York office of the Electric Storage Battery Company, Philadelphia, was at Boston during the convention. This company's specialty is the chloride accumulator.

Charles R. Brown represented the Pratt & Letchworth Company, of Buffalo

The exhibit of the Ohio Brass Company was opposite the entrance to the exhibit hall, and the first one to catch the eye on entering. The space was made very handsome and attractive by the artistic arrangement of the goods displayed, which included track-bending and overhead line materials, car supplies, commutators, bearings, bearing metals, etc. C. K. King, secretary, and A. L. Wilkinson, special representative, were in attendance.

Considerable attention was given by these interested to the electrical apparatus shown by the Johnson Company. The exhibit consisted of double equipments of 30 h. p. and 50 h. p. capacity mounted on trucks, and 35-h. p. motors on blocks with the pole pieces raised and lowered to show the access to the armature and field coils. Different types of controllers were also exhibited. The motors mounted on the trucks were connected up and were operated for the purpose of showing the working of the controllers which, on account of their simplicity, occasioned more than ordinary comment. From the number of interested visitors and the favorable criticisms expressed in general concerning this exhibit the Johnson Company representatives state they have every reason to be well pleased with the result of the Boston convention. H. C. Evans, F. S. Eient and J. A. Rutherford were present

P. G. Augher represented C. S. Schieren & Co., of New York.

Peter Leidenger and Joseph Leidenger, of the Dayton Manufacturing Company, Dayton, O., attended the convention.

A. B. Mendum, of Boston, was one of the several representatives of the Bihber-White Company

E. A. Chandler, of Detroit, represented the "Excelsior" self-oiling trolley harp

The Dearborn Drug & Chemical Works, of Chicago, were represented by R. C. Carr.

F. C. Brownell, of the Brownell Car Company, St. Louis, was at Boston in the interest of his company

President William Sutton and E. J. Lawless, eastern agent, represented the American Car Company, St. Louis

C. K. Knickerbocker attended in the interest of the Griffin Wheel Company, of Chicago.

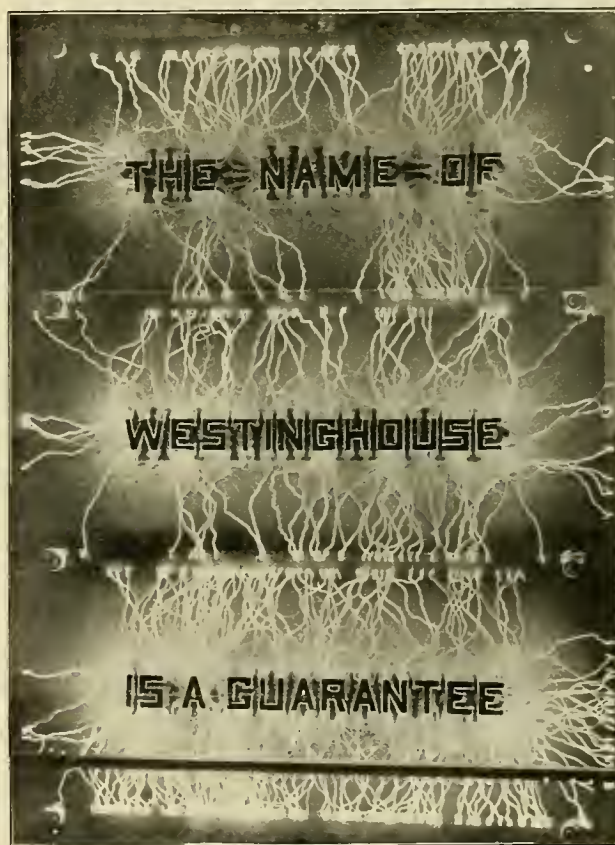
The American Electrical Works, Providence R. I., were represented by Eugene F. Phillips, F. Rowland Phillips, Frank N. Phillips, C. H. Wagensele, W. H. Sawyer, W. J. Watson and F. E. Donohue, George H. Olney, 2nd; C. R. Remington, Jr., P. C. Ackerman.

Adam Cook and John G. Engel, of Newport, were present in the interest of Adam Cook's Sons

Theo. A. H. Weintz, New York, sole agent for the Warrenton Woolen Company, manufacturer of all kinds of uniform cloths for street car men, was present, interviewing his many friends. This cloth is now standard on the Chicago City Railway and many other large roads.

The Duplex Car Company was represented by John A. Lowell, president; W. B. Crittenden, of New York; O. W. Marshall and George Moore. The exhibit consisted of a "Duplex" car built by the Briggs Carriage Company. It was a handsome piece of work and was examined with the greatest interest by the railway men at the convention

The gigantic sign "The Name of Westinghouse is a Guarantee," drew the attention of every one in the exhibit hall. The metal letters were mounted on a thick plate of glass and formed one of the terminals of a high voltage circuit. The current being unable to penetrate the glass spread out over the surface and around the edges like forked lightning. The company made a fine exhibit of street railway apparatus. There were a No. 49 35-h. p. motor with armature, core, coils and commutator exposed, a 12 A motor and a No. 38 motor with side suspension irons. The three types of controllers exhibited were the K 10, K 11 and the B 4. There was a 25-k. w. rotary converter changing a 500-volt direct current to an alternating current of 380 volts or vice versa, together with a complete switchboard. A 50-k. w., 60,000-volt trans-



IN THE WESTINGHOUSE EXHIBIT.

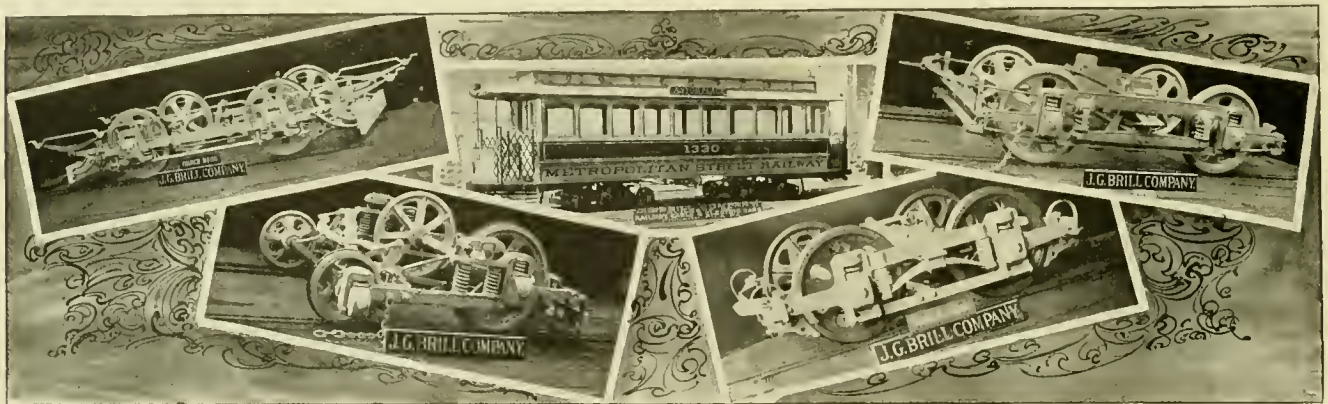
former proved of interest. Among the smaller street railway appliances were, six station and six line lightning arresters and one choke coil, a 1,000-ampere tank arrester, a 2,000-ampere, two-way switch and a 2,000-ampere circuit breaker with pneumatic operating attachment, a canopy switch, and a 2½-h. p. air pump and motor. There were 12 alternating current and direct current fans that stirred up gentle breezes, much to the comfort of the visitors for the first two days. The Westinghouse Electric & Manufacturing Company had the following representatives: Frank H. Taylor, general sales manager, L. E. Finley, W. M. Alexander, U. W. Storer and H. D. Murdock, of Pittsburg; Maurice Coster, manager of the Chicago office; Charles A. Bragg, of Philadelphia; Calvert Townley, of Boston; R. S. Brown, H. M. Southgate, W. W. Ward and H. C. Farnsworth, of Sawyer-Mann, Boston; J. R. Gordon, of Atlanta; C. C. Frenyear, of Buffalo and Ahren & Soper, Ottawa, Canada.



The exhibit of J. G. Brill Company comprised a line of its standard products and a number of street railway novelties. The standard Metropolitan closed car, at the entrance of the building, was noteworthy for its great length, being 37 ft. 2 in. over all, and seating 38 passengers. The car was built with a truss plank on each side and had window trusses as well as the longitudinal tie rods, giving strength and durability, and was mounted on "Eureka" maximum traction trucks. The convertible car exhibited combined all the advantages of a box and summer car, as it can be easily converted from an open to a closed car by the conductor and motorman in from three to four minutes, or vice versa. Four of the company's trucks were shown, the "Perfect," or No. 27, the "Eureka" maximum traction, the "Ideal" No. 21-E, and the No. 27-G trucks. The "Perfect" truck is especially applicable to electric locomotives which are to carry car bodies. The "Eureka" truck, with its short wheel base, ample room for motors, variable braking pressure and great tractive power, is in use both for heavy city traffic and fast suburban service. It carries a car as low as a 4-wheeled truck and with a single motor gives high tractive power. The "Ideal" truck for 4-wheeled cars has proven very durable in service and on account of the peculiar arrangement of springs rides with an unusual degree of steadiness. The 27-G is a modification of the "Perfect" with the motors hung outside of the axles, giving a short

treadle and weighted hammer. The treadle, when not in use, can be locked down so that the gong cannot be rung by accident nor by the jolting of the car. The blow is delivered after the treadle has reached its lowest point and when the hammer is entirely clear from the treadle, so that the sound is always clear and distinct. The hammer does its work by inertia and drops back after striking the gong, producing a clear musical note. Track scrapers have been made of almost every conceivable form, but the Littell scraper, as shown at the Brill exhibit, is certainly the simplest. It is put in operation by a mere touch of the motorman's foot and it is said that more than once, in case of a person falling upon the track, it has been dropped so quickly as to prevent the body from going under the wheels. The company was represented by John A. Brill, Samuel M. Curwen, W. H. Heulings, Jr., George M. Haskell, G. S. Hastings and Walter S. Adams.

The most unique and conspicuous feature at the convention was the great globe of the General Electric Company, which served to exhibit in a graphical manner the world wide use of machines and instruments of its manufacture. It was 25 ft. 2 in. in diameter, with a scale of 312 miles to 1 ft. and was mounted on a pedestal 16 ft. in diameter. The globe was built up of papier mache upon a frame work of wood, and no less than 2,700 sq. yds.



CAR AND TRUCKS IN THE BRILL EXHIBIT.

wheel base of 4 ft. and also enabling the car body to be brought very low. Quarter size brass models of the "Eureka," "Perfect" and "Ideal" trucks were exhibited in parlor G. Hotel Brunswick, and were much admired by all visitors. Among other novelties round end seat-panels were shown. These are especially strong, as they are easily and accurately fitted and have become very popular with street railway men and car patrons. Dunning's draw bar is a simple mechanism which by means of a pocket at the rear and a latch controlled by a rod at the front end of the car, enables the draw head to be thrust back so as to have the whole front or buffer of the car clear without a projection beyond it. The Millen sign, an invention of Thomas Millen, general master mechanic of the Metropolitan Street Railway Company, New York, is both simple and ingenious. The idea is to provide simple means for operating box signs from the inside of the car or from beneath the hood. It consists of a pair of bevel wheels contained in a casing at the end of the sign. To one of the wheels the sign is connected; the wheel is, in fact, mounted on the axis of the sign. The axis of the other wheel projects downward through the hood and terminates in a hand wheel which is marked with letters indicating each one of the four sides of the box sign. By turning the wheel anyone of the signs can be brought so as to face outward. The signs on the side of the car can be moved from the center of the car inside, those on the hood can be moved without leaving the platform. The new Dedenda gong struck most street railway men who saw it as being both neat and efficient. The mechanism consists of a

of paper were used in its construction, which required two months. The continents and oceans were painted upon the surface of the globe by a scenic artist. A 100-c. p. incandescent lamp marked the north pole and small incandescent lamps of different colors indicated the location of cities in which the General Electric Company had installed some street railway, mill, mine or lighting machinery. For this purpose 400 lamps were placed, although if each installation instead of cities were so marked it would have required several thousand. As an instance, had each plant in New England been marked, the entire surface representing New England would have been covered with lamps 40 tiers high. The lamps were on the map of nearly every country in the world, indicating the world wide business of the company. A small national flag was placed within the boundaries of each country. The equator was marked by a small track, around which a miniature electric car traveled. This globe will be sent to Paris to be placed in the General Electric exhibit in the Exposition. There was an exhibit of street railway machines and instruments, but this was not as extensive as it might have been, for with few exceptions the generators, motors, controllers and switchboard instruments of the Boston companies are the product of the factories at Schenectady and Lynn. An illuminated sign gave the following figures of the street railway apparatus sold by the company up to September 1, 1898.

Two thousand two hundred and eighty-five railway generators, aggregating 423,101 h. p.; 52,841 railroad motors, aggregating 1,270,865 h. p., and 50,000 series parallel controllers. W. J.



Clark, general manager of the railway department, was assisted by C. B. Davis, F. M. Kimball, C. C. Pierce, C. D. Haskins, S. B. Paine, G. E. Steele, J. S. Butler, of the Boston office; H. R. Beach, T. Beran, J. J. Mahoney, T. A. Branion, T. Weare, W. G. Bushnell, New York office; Theo. P. Bailey, Chicago office; G. D. Rosenthal, St. Louis office; H. J. Crowley, Philadelphia office; A. D. Babson, Baltimore office; H. T. Heywood, Atlanta office. The supply department at Schenectady was represented by J. R. Lovejoy, general manager, H. C. Wirt, engineer and J. K. Aitken; the railway department by W. B. Potter, chief engineer, F. E. Case, E. D. Priest, L. C. Batchelder and C. A. Barry; the patent department by A. J. McDonald, Arthur Baldwin

The New York Electrical Works, of Brooklyn, were represented at the convention by J. H. Henderson

Richard Devens, engineer, represented the Weber Railway Joint Manufacturing Company, of New York, and exhibited the Weber joint.

Frank MacGovern, of Rosstiter, MacGovern & Co., 107 Liberty street, New York, dealers in electrical machinery, was at Boston during the convention.

Clift Wise, of Chicago, the well-known general contractor for electric railway, paving and underground conduit work, was in attendance at the convention

W. W. Whitcomb, president and general manager of the Composite Brake Shoe Company, Boston, had a very interesting exhibit of new and service-worn "Compo" shoes with cork insets.

Wendell & MacDuffie, of New York and Boston, dealers in electric and steam railway supplies, were represented in Boston during the convention by Jacob Wendell, Jr., R. L. MacDuffie and B. F. Ager

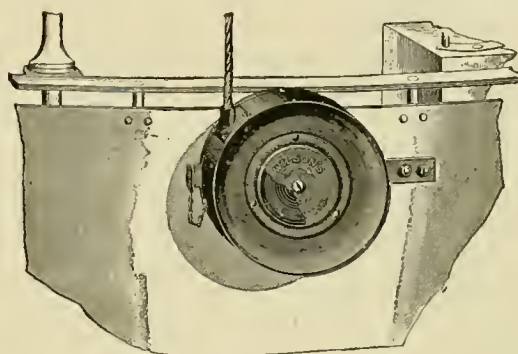
The Central Union Brass Company, of St. Louis, made no exhibit in the hall but T. C. White was in attendance at the convention and represented the company. He distributed watch charms, miniature trolley hangers, for souvenirs. The company makes a complete line of overhead material, trolleys, gears, pinions, etc. W. R. Garton Company is its Chicago agent.

Among others present at the convention we noted:

- H. B. Ham, New York, Babcock & Wilcox Company
- B. J. Jones, Chicago, Sargent & Lundy.
- Charles W. Jefferson, Mica Insulator Company
- Newton Jackson and D. H. B. Rockwell, Scranton, Pa., American Mutual Indemnity Company.
- E. W. Hodgkins, Chicago, Q & C Company
- George F. Porter and Romaine Mace, New York, Okonite Company.
- E. I. Robinson, St. Louis, Laclede Car Company
- E. G. Knapp, Sandusky, O., Partridge Carbon Company.
- C. S. Van Wagoner, Cleveland, Van Wagoner & Williams Hardware Company.
- J. A. Brett, Chicago, Electrical Installation Company.
- John Jackson, Pittsburg, Simonds Manufacturing Company.
- W. W. Wharton, Philadelphia, Electric Mutual Casualty Association.
- Henry B. Cutter, Philadelphia, Cutter Electrical & Manufacturing Company.
- L. A. Lockwood and A. F. Montgomery, Pawtucket, R. I., Crefeld Electrical Works.
- H. G. Brinkerhoff, Boston, Fuel Economizer Company.
- Henry Daily, Jersey City, Joseph Dixon Crucible Company.
- George C. Bailey, Chicago, John A. Roebling's Sons Company.
- Giles S. Allison, St. Louis, St. Louis Register Company.
- J. A. Granger, New York Car Wheel Works
- J. N. Parsons, Pittsburg, A. Mertes Manufacturing Company.
- Frederick A. Lex, Wilmington, Del., Lobdell Car Wheel Company

## WILSON TROLLEY POLE CATCHER.

One of the most practical car devices which has been introduced of late is the trolley pole catcher and reel made by Wilson, Thomson & Co., of Brooklyn, N. Y. Its object is to catch the pole instantly after the wheel has left the wire and hold it securely until released by the conductor, thus preventing damage to overhead wires. The illustration shows the catcher attached to the dash, but this is only one of several ways of applying it. The reel is regulated by a long clock spring, taking up the slack rope and feeding it out to the trolley pole according to the inequalities of the line. The device permits an increased pull upon the trolley pole spring, or the pull may be diminished to a much lower standard than is practical without such attachment, because it acts instantaneously either at high or low pressure of the trolley on the wire. When the wheel leaves the wire



there is absolutely no shock to the trolley, no jumping of the trolley from the car, no blow to each trolley wire hanger, but the trolley is simply held firmly in place with no possible damage to any parts. Street railway managers, and especially those operating high speed lines, will appreciate a device for accomplishing what this performs. The "catcher" has been in service on five different roads for over a year and has proved practical, substantial and durable. Orders and recommendations have been received from the Brooklyn Heights, Norfolk, Mahoning Valley, Brockton and other street railway companies. Chas. N. Wood, of Boston, was so well pleased with its operation that he has taken the New England agency and is doing a good business in this line. The Wilson trolley pole catcher is the only successful device for that purpose on the market.

## TROLLEY WRECK AT COHOES.

One of the most terrible disasters that ever happened on a trolley line was caused September 5 by an express train crashing into a trolley car at Cohoes, N. Y., causing the death of 18 passengers and seriously injuring many more. The car was loaded with 70 picnics returning from a Labor Day demonstration at Rensselaer Park. The flagman at the crossing signaled the car to stop and the conductor got off to run ahead of the car, but at the crossing there is a considerable grade, and the car did not stop. The motorman stated before he died the brake broke and he had no control of the car. The train was running 50 miles an hour and the trolley car was smashed into splinters.

## CHICAGO'S HOTELS.

The hotel facilities are always a leading question in determining the convention city for the street railway association meetings, and on this point the Chicago delegation had no trouble in promising unequalled accommodations. The advantage of housing as large a number as possible at one place is well understood, and in all probability the Auditorium will be chosen as headquarters in '99. The main building on the American plan, and the Annex, connected with it, on the European, give a choice of either, and together the hotel can accommodate 1,000 guests and still maintain its excellent service.

## THE NEW YORK CONVENTION.

Sixteenth Annual Meeting of the Street Railway Association of the State of New York at Brooklyn, September 13 and 14—A Large and Enthusiastic Gathering—Excellent Papers—Interesting Discussions.

The sixteenth annual meeting of the Street Railway Association of the State of New York, closely followed the adjournment of the American, and held its sessions at the Manhattan Beach Hotel, New York, on September 13 and 14. The attendance was good, including over 100 street railway delegates and supplymen.

President G. Tracy Rogers, of Binghamton, presided in his usual genial way, calling the opening session to order at 11:15 a. m. Following the roll call came the address of President Rogers.

### ADDRESS OF PRESIDENT ROGERS.

It is my pleasure and privilege, as president of the Street Railway Association of the State of New York, to extend to you a most hearty welcome to this, our sixteenth annual convention.

I consider it fitting, at the outset, to mention a calamity that has recently overtaken us. Since our last annual meeting, an Almighty Power has seen fit to call to his long rest our much beloved and respected attorney, Hon. Edmund O'Connor, in the death of whom the people of this state, as well as our association, have suffered a great and irreparable loss.

Mr. O'Connor has been our attorney for the past three years, and in that time has won the esteem, confidence and respect of the Association. We all knew that a matter placed in his hands would be attended to with promptness, ability and integrity, and we always felt that our cause was in a master's charge, and would be presented in an intelligent and courtly manner. He thoroughly believed in the work of the Association, and courageously defended its interests. He was honest and true to the cause he represented; a man fearless and aggressive, possessing vigorous eloquence, always expressing his honest convictions in an earnest and convincing manner. No officer or member of the Association has been more zealous or faithful in the discharge of his duties than he. He needs no eulogium—his true, honest and upright life is his eulogy, and the place he has won, and will always retain in the hearts of those who knew him best, his monument.

The Street Railway Association of the State of New York is larger, stronger and more representative than ever before, and is now recognized as an important factor in the operation of the immense business interests which it represents. The increased interest of the individual members of this Association is the principal cause of our development and strength. Each year our conventions are more largely attended and more interest shown in the work. The benefits to be derived from the interchanging of ideas at these conventions where one may profit by another's experience is incalculable. Being free from the petty jealousies which naturally follow in most business channels, we can discuss with freedom and profit to each other the most minute details of our business.

The affairs of the Association at Albany have been conducted during the past year by the executive committee in a most conservative, dignified and frank manner, asking for no special favors in regard to new legislation, and making no opposition to any laws introduced which would benefit the traveling public. Many bills were introduced during the past year, which no doubt were offered with an honest purpose, but when the impracticability of the measure was shown, we found no disposition on the part of the legislature to push the passage of the bill. We are to be congratulated upon the fact that the people elected to enact the laws of the State of New York are not socialists, populists or anarchists, but are, as a rule, clear-headed, conscientious, representatives of an intelligent, honest constituency, ready to listen to arguments and to legislate for the best interests of all.

During the past two years that I have occupied the honorable position of president of this Association, I have called upon

many of you to appear before the various committees at Albany, and have, in almost every instance, met with a prompt response and ready co-operation.

A very interesting line of topics for papers and discussion will be presented at this convention. The value of the papers offered will be greatly enhanced by a thorough discussion of them by you, for in this discussion the experience of others on the subject treated is brought out, and the author himself elaborates in a way not possible in his paper, upon many points which will be alluded to in the discussion.

I suggest that every one present will find it advantageous to carefully consider the various topics discussed, select and make mental or written notes of any point in which he thinks that his experience would be of value to the others in attendance, or relative to which he would like expression from others. Some may hesitate, thinking that the conditions are probably different from those of other companies; even if this be true, the discussion cannot fail to bring out matter of value to all present.

Rapid transit in large cities has exerted a marked influence for the health, comfort and welfare of the resident poor and working classes, and has resulted in an equalization of real estate values, thereby avoiding a congestion of the population that has existed in the past, and creating better living conditions for all. It has opened up large areas of valuable properties hitherto inaccessible, but now within time distance of important and objective points.

The local transportation companies are fairly entitled to the public aid and encouragement, which has in many instances been grudgingly given, as numerous difficulties have demonstrated.

The return upon the capital invested in street railway enterprises is generally overestimated by the public; many lines are constructed or extended and operated at an actual loss for years, but I believe that the public begins to see and appreciate the great advantage on their side, and that a more liberal policy will prevail. Within the past year the development of rapid transit has been remarkable, notwithstanding adverse circumstances, including the war with Spain. The advance has been steady and prosperous, noticeably so in the city of Brooklyn, whose honored guests we are today.

In relation to rapid transit and its development in Brooklyn, I might mention that the operation of through cars from the remotest districts of Brooklyn direct to City Hall, Manhattan, is now an accomplished fact. Nothing was more needful for the convenience of the residents of Brooklyn and the building up of its outlying territory than a quick and convenient mode of transportation to New York. That it has filled a long felt want is evidenced by the tremendous popularity it has attained. The number of people carried back and forth seems to be limited only by the number of cars which can be operated with celerity and safety. The present and prospective development of Brooklyn is due, in a large measure, to the enterprise, business sagacity and excellent management of the several surface railroads for which the "City of Churches" is justly noted.

In my address of 1896, I stated that the Great City of New York was far behind all other cities of the state in modern transportation facilities. It was my pleasure at the last convention to call your attention to the progress made in the installation of improved motive powers in the old City of New York. It then appeared that the State Board of Railroad Commissioners had authorized the use of electricity upon railroads covering 110 miles of track. Since that time the railroads have put in operation over 86 miles of trackage, of which 54 miles have been constructed and completed during the present year.

The rapid track construction in the city of New York, involving, as it does, the reconstruction of sewers, changing and laying



gas and water pipes, has been one of the noticeable features in railroad history, and deserving of great commendation, which has been bestowed by the New York press. The reconstruction of the Sixth and Eighth Avenue lines in 25 days after the ground was broken, on July 20, so as to permit of the temporary operation of horse cars to the shopping centers for the convenience of the public, is a record unparalleled in city railroad construction. With a power house costing \$3,000,000, New York city will be furnished with a system of transportation that may well be envied by all roads of the country.

At the present moment the Metropolitan Street Railway Company is engaged in reconstructing 22 additional miles of trackage for operation by electricity, leaving a balance of 120 miles of the Metropolitan system, and 114 miles of the Third Avenue system, yet to be transformed.

The interest in the cable system is now purely historical. It has served its purpose, and served it well, but its day is done. From the railway standpoint, there is nothing to be hoped from it, but we all look back on it with gratitude, as it was first instrumental in displacing the horse.

Its availability for overcoming heavy grades cheaply remains unimpaired, but its merit for average transportation has been excelled by electric system.

It is also noticeable that the problem of developing the compressed air system has been taken hold of with great energy in New York city, and in the hands of competent men in control of it, it is anticipated that it will prove effective on lines fitted for the use of such form of power.

The much feared monopoly in the beginning of this decade has proven to be a great benefit to the traveling public, which I am satisfied they now recognize. There was no chance for competition between two or more roads in the early days unless attended by disastrous results to themselves and the public, whom they served.

The free transfer, which has been one of the greatest blessings that the traveling public has ever received in this country, was largely the outcome of this consolidation. The railroad company owning all the lines can now cater to the necessities of any one or more localities in its municipality, and there is no one thing to my mind that would be as beneficial under the present situation as the consolidation and control by one company of all surface and elevated railroads, and the underground railroads (if any underground line is ever built). This is also true of the city of Brooklyn. I would still further state, if a common motive power was used, that there would be still greater advantages to the public which all street railway men can readily recognize.

The resolution recently offered in the city council of New York—"No seat, no fare"—is simply another manifestation of the old delusion that all that is necessary to get rid of an evil or an annoyance is to pass a law against it. The question is not one making the companies do something they are not willing to do, but one making them perform an impossibility. In order to make a law of this character workable, there must be a penalty imposed on both parties, but this proposition is un-American, and such interference with personal liberty would provoke a storm of popular resentment.

In discussing rates of fare, many comparisons have been made between European and American rates. In Europe the rate is governed by the distance traveled, similar to the steam railway. The American system has particular advantages and benefits for the people at large, and Europe is bound to acknowledge that under our system American enterprises have done more in ten years to bring about a radical change and better conditions for the public than has been accomplished in Europe in a century.

Should the practice of municipal ownership be carried into practice and effect, all business enterprises would soon be under governmental management and control, leaving no hope for the ambitious, enterprising citizen except to secure a political position and eke out a meagre existence and to be subject to the caprice and whims of fickle political autocrats.

With our present system of municipal government, the ownership and operation of street railroads by municipalities would have a tendency to convert these enterprises into powerful polit-

ical machines, the result of which would be detrimental to public welfare. No government, either state or municipal politician, should embark in an enterprise that can be as well or better conducted by private capital. The management of a large street railway system requires the efforts of a life study and years of practical experience—accomplishments not possessed by the average office holder.

The electric railway is fast superseding other methods of transportation, and it is today one of the greatest moral and financial powers. From its infancy it moved the public, and it still continues to do so to no small degree. As a moral power and influence its effect is wonderful. It has elevated its employes and caused them to respect their position, their superiors and themselves. It has enabled the workman to buy, at a moderate price, a small home, and begin payments on it, in localities where land is less valuable and where each house may be detached from its neighbors, thereby elevating and bettering mankind.

Wherever the electric railway goes it enhances the valuation of property, raises the price of real estate, and in many instances dwarfs communities, towns and villages have, by its enterprises sprung into prominence and manufacturing centers, or have become desirable places of residence for the city business man. The electric railway, like other great enterprises, has had to fight its battles, but in most cases its bitterest enemies have become its strongest advocates.

Some of the demands made by the public and daily press are very inconsistent and absurd, but as a rule the public is reasonable and very appreciative of things done for their benefit. The unwarranted and unjust attacks made by the local press, in many of our cities upon the street railways, have worked damage both to the railroads and the cities, but the new life which has followed the evolution of rapid transit and the capital invested to accommodate the public have, in a measure, disarmed the press, and it no longer strikes a popular chord by abusing the management and services.

In many instances the attacks of the press in some of our smaller cities and towns have been the means of deterring a timid capitalist from investing in securities necessary to build up these roads and incidentally the city itself. Whatever improvements are made by the street railway invariably redound to the benefit of the town or city where such improvements are made.

The money required to build and equip our roads, outside of large money centers, has largely come from outside sources, and it is an investment which pays taxes, and furnishes the public increased facilities and accommodations. In the early history of street railway the man who subscribed for stock in such enterprises was considered a public benefactor and philanthropist.

Few, if any, of the great industries of the world require more brains and breadth of mind than is necessary to satisfy the transportation needs of the public, and we find these qualifications strongly in evidence in the work done in public and private of the development and operation of railway enterprises. The broadening out processes which have been at work in the street railway industry is most thoroughly satisfactory in the results achieved.

The evolution from the horse car to the electric system is an immeasurable increase of the growth and efficiency of the working forces from top to bottom in the skill, intelligent professional ability and administrative power which modern street railways demand and obtain.

It is safely estimated that there are today upwards of one hundred and seventy thousand people in the United States employed on the street railway, and an invested capital of over eight hundred and fifty million dollars, and trackage of over sixteen thousand miles.

Indemnity insurance is a problem now confronting the street railroads of the country, and is a proposition worthy of the most careful consideration. Many of our roads are now insuring themselves, or in other words, taking care of their accidents, and I am informed, in some instances, with very satisfactory results. We have been passing an educational period and accidents are growing less each year as the traveling public becomes more acquainted and accustomed to rapid transit. We are not

subject to the heavy verdicts as heretofore, the people having not only become reconciled to the change of motive power and the other necessary changes attendant on it, but also now recognize the many advantages gained for their personal comfort and business necessities.

The jurymen of today does not regard the street railway of his locality the monster that he was led to believe when electricity was first installed. The wild speculation formerly rife throughout the country in the street railway world has today settled down to business, owned or controlled largely by the community in which the respective road is located, and it is a recognized fact that the street railroads are having all they can do to take care of their expenses, interest accounts, and to keep pace with the spread and growth of population which they originated.

Stimulated travel is today the dividend and profit of most street railways. The manager of a street railway has found that in order to make his road to do anything more than pay expenses and interest, he must increase travel. The manner of stimulating travel is governed largely by the environment or surroundings with which he is confronted. The necessity is so apparent that in large roads there is a special department set aside for this purpose. I am satisfied that the morals, health and habits of communities have been largely benefited at a very small expenditure on their part by the entertainments and inducements furnished by the railroad companies. The rich and poor Sunday Schools and the various societies, one and all, travel together.

It is a duty of every manager to do his best to furnish as efficient, safe and pleasant accommodations as the earnings of his road will justify, and it is better to anticipate these improvements, which are bound to come some time, than to wait until the last moment, reluctantly forced to comply. The successful superintendent cannot operate his road from his office, but in order to adequately meet the requirements of the public, he must be in close touch with their wants. He should travel over his road in his own cars, and in that way get closer to the public and gain considerable valuable information, which he could obtain in no other manner. The street railroad manager has learned that it is not only policy but profitable to cater to the best element. This fact alone has had much to do in gaining the confidence and respect of the public, the press and the city officials.

The interurban railroad is creating a new going and coming which is the essence of the evolution going on throughout the country. The facilities furnished by the frequent service are broadening out the acquaintance and showing to the people the value of the interchanging of ideas and experiences hitherto not understood or appreciated. The interurban railways are attracting more attention this year than ever before. The success which has attended the operation of these lines and the unheard of possibilities have been a surprise to the public. When they come into competition with the established steam road they have been able to divert almost the entire travel. The frequent and the lower fares charged, with electric operation, makes competition by steam lines both difficult and expensive. The investor begins to realize that when the difference in the cost of construction and the freedom from the burden imposed in cities are understood, the interurbans are by no means less attractive than city lines, and the development of these country lines are surely destined to grow into large proportions during the next few years.

By means of the three-phase alternating system, which has been developed during the last three or four years, it is possible to generate energy and transmit it economically for a distance of 30 to 40 miles, and I understand there are roads upwards of 50 miles using this system without serious loss in transmission.

The spirits of emulation in employes is being more cultivated each year, the management learning by experience that an educated, satisfied employe will give much better satisfaction to the management and more efficient service to the public. Too much interest cannot be taken, I believe, in this department of our business.

The past year has not shown in gross earnings the same per-

centage of gain as previous years, especially with some of the larger roads, which is not surprising, everything considered. Operations and plans deferred on account of the war will now be taken up with new vigor where they were dropped last February.

Most lines of business have done fairly well in spite of the war cloud that has hovered o'er us, but following the discontinuance of hostilities, there will come a restoration of commercial confidence, and the general belief prevails that business of all kinds will bound into activity, and that prosperity and peace will jointly reign, thereby assuring a prosperous era, which I hope every street railway in the State of New York will enjoy until we meet in convention again.

After the hearty applause, which followed the address, came the

#### Report of the Executive Committee.

Your Executive Committee respectfully submits the following report:

##### MEMBERSHIP.

Our Association is today larger and more representative than ever before in its history. The largely increased membership, and not a single withdrawal during the past year, bespeaks the confidence of the street railroads of the State of New York in the Association and its work.

The necessity of united action in protecting and caring for our general business interests has become more and more apparent with each succeeding year. As a result, most of the street railroads of the state are now identified with the Association, although there are still a few who are non-members. We concur with former Executive Committee reports, in asserting that every road in the Empire State should be represented in the Association, and we urge renewed effort on behalf of the members to accomplish this end.

##### FINANCES.

The Association is entirely free from debt, with a comfortable balance in the treasury. We advocate, as have our predecessors, that an available fund of sufficient amount be kept in the treasury to properly meet any emergencies that may arise.

##### SPECIAL WORK.

We also wish to commend the interest manifested by the individual members of the Association in their prompt attendance at special hearings, and their general co-operation in other ways.

The usual number of letters and circulars pertaining to legislation and other important matters have been sent out during the past year. We believe the same have proven effective in the accomplishment of their purpose.

##### LEGISLATION.

A larger number of bills affecting street railroads were introduced in both branches of the State Legislature last year than ever before. One hundred and ninety different measures and amendments thereto, directly bearing on the organization, construction and operation of street railways were offered. It is needless to state that the caring for such a volume of legislation required watchfulness and care on the part of the officers of the Association. Notwithstanding the large number of bills introduced, only a few became laws.

We would consider ourselves remiss in the discharge of our duty if we did not express in this report our appreciation of the courtesy and attention shown the street railroads of the state by both branches of the legislature in their careful consideration and just disposition of the numerous street railroad bills introduced.

##### OBITUARY.

It is with the most profound sorrow that your Executive Committee alludes to the death of our beloved attorney and counselor, Hon. Edmund O'Connor, whose demise on Friday, July 15, 1898, deprived this Association of one of its most ardent friends, zealous workers and interested advocates.

Senator O'Connor's death was a public calamity, forcibly felt throughout the entire state. Stricken down in the full vigor



of a noble manhood, when at the zenith of his usefulness, his removal seemed unwise and untimely, but without questioning the wisdom of an inscrutable Providence, we believe that "He who doeth all things well" ruled for the best.

We deeply deplore the irreparable loss of the eminent statesman, distinguished jurist and noble man. Admitting the emptiness of an attempted eulogium, we simply say, "A noble life well lived. May he rest in peace."

G. TRACY ROGERS, President.  
HENRY A. ROBINSON, Secretary.  
H. H. VREELAND.  
JOHN W. McNAMARA.  
HENRY M. WATSON.  
CLINTON L. ROSSITER.

The treasurer submitted a report showing the gross receipts for the past year to be \$6,205; balance on hand from last year, \$1,359.71, making a total of \$7,564.71. Disbursements during past year, \$6,400.26, leaving a balance on hand to the credit of the Association of \$1,164.45.

C. L. Rossiter, on behalf of the local committee, announced the entertainment planned for the guests, including a trip to the Navy Yard.

The consideration of reports followed, the first being

#### METHODS OF DEVELOPING NEW TRAFFIC ON STREET RAILWAYS.

By H. M. Kennedy, G. P. A. Brooklyn Heights R. R. Co.

If the extensive railroad and steamboat transportation companies have been successful all these years in inducing people to spend dollars, how much more easily can the finely developed street railway interests of the present day encourage them to spend nickels. Especially with the advantage in favor of city transportation companies, having a compact mass (in the case of New York city over three millions of people) to reach by cheap advertisement, where it is necessary for the steam railroads and steamboat interests to do more expensive advertising and maintain a larger department to reach a lesser number of people scattered over a wider territory.

But since the evolution of street railroading from antiquated horse car days, when people only rode because they had to, to modern methods of the electrical propulsion, with heavy and comfortable equipment, it has become necessary to revolutionize methods in the executive, operating and traffic departments. And here is where we profit by the experience and ability of the old organized companies in methods for developing new traffic on street railways.

Therefore, the establishment of a "Special Traffic" or "General Passenger" department is the first essential feature to systematically encourage the increase of traffic. The head of this department, usually known as the general passenger agent, is directly responsible to the general superintendent, with whose office he is connected.

After the selection of a competent clerk, who must be familiar with the territory covered by the lines represented, and also affable and diplomatic in his treatment of callers on various missions, from the solicitor in quest of an "ad" to the society girl who charts a parlor car for an afternoon tea;—and a stenographer, the traffic department is ready for business.

This arrangement permits the head of the department to be in or out as circumstances require. The personal acquaintance of all city editors and local railroad reporters is the first essential move. This preliminary call should be accompanied by an explanation that the management is desirous of catering to the public by giving a more efficient service with better equipments than has ever been offered before, and that he desires their good will and assistance rather than their enmity and antagonism. This establishes congenial relations between the management and the press with the result that "news items" sent in are generally given space. This attention with the paid advertisements

that are inserted from time to time cement relations that are very valuable to railroad companies. Referring again to the trunk line railroads, they find this item so important as to maintain a "press agent" and staff, at considerable cost, to handle the press. They are on the staff of the general passenger agent, and of course assist him in handling the "ads," etc.

Now, as to new business. This is the result of special trolley party traffic, pleasure riding to resorts especially established for the purpose, and the generally increased traffic of shoppers and others resulting from the introduction of modern equipment which makes a trip in the cars a pleasure. By building special buffet parlor cars, handsomely upholstered and completely equipped, and arranging open excursion cars decorated with American bunting and brilliantly illuminated, it became possible to go into the excursion field formerly monopolized by the railroads and steamboats. There are churches, clubs, lodges, societies, employes of large establishments and others who annually indulge in one or more outing event. It is only a question of soliciting to get at least a large share of this. With this equipment, street railroads have a decided advantage over their competitors, inasmuch as they are able to convey special parties from their very doors to any one of a number of picnic groves or pleasure resorts, traversing a picturesque country, and without change of cars. It also permits the excursion party to pass through its own particular neighborhood, on which detail they are at times so particular as to pay \$5 per car additional trackage to run over the lines of another company, sometimes only for a few blocks, to appease this sentiment. This class of traffic encourages general riding, in that persons going on special trolley trips learn the various attractive routes of the system, with the amusement places, and afterwards take trips, individually or in groups, that they otherwise would possibly never have thought of. The efforts expended on behalf of special cars, as parlor and illuminated, also result in increased business in the chartering of "regular" cars for special service; or it causes Sunday School picnic parties and others to select some grove or park on one of the company's lines, but not being able to pay for the more expensive special cars, are content to charter a "regular," which transports them over their special route.

As to pleasure resorts, it is essential that some form of attraction for the amusement of patrons be established at terminal points, or that existing terminals that end "no where" (as expressed by the leading stockholder of this company) be extended to "somewhere."

The point in case is worthy of mention as an illustration. The Flatbush avenue line of this company, after passing through the Prospect park section and the suburban settlement, Flatbush, terminated at King's Highway in the village of Flatlands, where the surroundings were the usual country store and post office, a barber shop and saloon. A mile or so beyond was a fine wooded island, with a beach fronting on Jamaica bay, but inaccessible. By co-operation with the owners, who were capitalists that had purchased the property from the original sellers, this company agreed to extend their tracks upon the understanding with the owners that they would establish a first-class pleasure resort and grant free terminal facilities. Within a few months a typical amusement center had been established. This is Bergen beach. Its appearance is attractive, the buildings being of Moorish architecture; 50,000 persons have been entertained here in a single day. This is its third summer. The Brooklyn companies are more fortunate than those of most cities in having lines that reach a well-developed coast along the ocean, sound and adjoining bays; also many city and private parks, with a suburban country covering three points of the compass; so that, while we do not maintain any amusement places, we know the value of such, and think they are necessary adjuncts to all roads in one form or another. As to the details of attractions, this subject has been so well covered by the experience of most companies as stated in our prominent street railway publications, and its repetition here is not desirable.

We personally visit the owners or proprietors of all the pleasure resorts on our lines at frequent intervals, and in this way learn their plans for attracting patronage, sometimes offering suggestions for our mutual advantage, and often inducing them

to put out special advertising matter. The result of this is obvious. On several occasions where large colored poster work has been done, our company has contributed a portion of the cost. As an example, the management of North beach was induced to spend over \$5,000 on a 20-sheet poster in high colors, and an issue of 1,000,000 of a "cut-out" with amusement coupons attached. Of this sum we paid but a small portion. The result was highly satisfactory to all. We induced another large park proprietor to spend over \$3,000 in poster work alone, and on to a lesser degree. Then we assist them all by card displays on the cars, and in special instances by a "perambulator" car containing a band of music. Another method that has been considered for advertising these resorts is to form a pleasure resort press bureau, to be maintained by a "pool," contributed to by the railroads and resorts interested. This for next season.

Only last week the three Brooklyn roads contributed half, and the principal amusement interests at Coney Island the other half, for the immediate display of posters to prolong the season. "Gay Coney Island still wide open—fare five cents," etc., etc.

In addition to the co-operative advertising just mentioned, we keep the public well informed as to where and how to go, and how to keep cool for a nickel during hot weather. Cards displayed on the dash as well as flyers, snipes, hangers and cut-outs, and other novelties are the most effective methods. Very large posters well done are decidedly the best medium for developing new traffic. To have for the general information of the traveling public an artistic booklet that will fit the pocket, containing sketches of the most attractive trips and places, as well as all routes, transfer points, chartered car rates, etc., will be found invaluable. The "ads" will pay most of the cost. We have been dealing largely with summer traffic.

Now, referring to winter, we have the theatrical, ice skating rink club and other special interests. Traffic can be developed by co-operation with these interests, such as by card display on fenders (for which they are willing to pay), and by having them "post" territory accessible by your lines which have been overlooked by their agents, etc. We had a strong illustration of this last winter. The business of a large ice skating rink had been lagging when we induced them to display cards in the windows of every car on the system, for which they paid us a substantial sum per month, and furnished the stock. The management said the result was beyond their most sanguine expectations, and from the verge of failure came success.

But special cars, pleasure resorts, advertising and co-operation are not the only methods for developing new traffic. Clean, ample cars, through lines and generally efficient service are requisites to satisfy those who are induced to patronize the road and hold those who are already patrons, making it such a pleasure to travel as that they would rather be on the road than at home.

The President:—Gentlemen, we ought to have some discussion of this very able paper. Mr. Johnson, cannot you give us some information in regard to your road?

Mr. Johnson:—I hardly know what to say on the subject. I think Mr. Kennedy has fully covered the matter. The Nassau Road some three years ago introduced what is known as the five-cent system in Brooklyn. We had last season practically a monopoly on Coney Island business, and you might say sea shore business. This season the other street railroads, which represent 75 per cent of the carrying capacity of Brooklyn have gone into Coney Island, Bergen beach, as Mr. Kennedy has described, and the different seaside resorts; and notwithstanding that fact our business has increased steadily throughout the summer notwithstanding the fierce opposition we have had. It only goes to prove that in a large community of this kind, if proper inducements are offered, there are plenty of riders. Our Sunday business has been only limited by our capacity. I believe that is equally true of Mr. Rossiter's road and Mr. Hein's. They, of course, have a great many large, well-equipped city lines that they can take their cars off of on Sunday and turn toward the seashore without robbing to any great extent the regular Sunday riders on those business lines. I know that is equally true of the Nassau Road. We have

lines such as the Seventh avenue on which we do about half the business on Sunday that we do during the week, and on Sunday half the cars are taken from those lines and turned into Coney Island, Canarsie, etc., with very good results. One of the things I would like to call your attention to is this: I have a car that is not the dream of an inventor but a thing that has come about I think in a natural way—an open car of ten seats which is 31 ft. 6 in. in length, the longest four wheel open car that I know of. I discovered as soon as I put them on in April, although it was chilly and cold, that our receipts always went up. The moment we took them off in the fall, while the weather was not by any means summer weather, our receipts immediately went down. In figuring it out I came to the conclusion that the average closed car that we had which is 20 ft. in length seated about 24 people. There are times when they will seat 26, but they will average 24. The car that we ran through the summer will seat comfortably 50. So we have virtually taken off the 10-bench car and replaced it with a 5-bench car. My endeavor has been to keep that 10-bench car in service the year around. In going over the Brooklyn bridge, which is practically a new thing, in loading or unloading a closed car at the other end of the Brooklyn bridge the passengers, as a rule, went in at one end and out at the other. Now with this open car, converted as I have it, we have six exits, one at each platform and four doors. I have simply taken the car and made the seats that formerly all faced forward into vis-a-vis seats and utilized the dead space by moving the backs of the seats closer together. I have closed up the inside of the car entirely and put four doors on it. I ran that car through the entire summer. I will have 250 on the road by the first of October. That car I ran during the months of June and July with a few newspaper people in it; one side solid with glass with two front windows which were let down at three different heights that I can hold it at. With a temperature of 93 the car was as pleasant as any average open car you can ride in. That car, I believe, will be warmer than any closed car I have on the road, for the reason that the doors on the front end of a closed car are bound to be made with from 1-16 to half an inch play to have the door work backwards and forwards easily. When that car is in motion you have the natural air pressure plus the speed driving that air into the car. With this car that I speak of the front of the car is entirely closed up and you have only the natural pressure when the car is at a standstill to come in from the side of the car. I have a heater directly under each seat, back in such a way that it is not possible for a woman's dress to come in contact with it. In the summer time it is equal to any open car other than compelling the persons on three seats to ride backwards where they formerly rode with their faces the way the car was going. But in April, May, September and October that car can be made absolutely comfortable in case of a rain storm because you can keep the weather out. There are only four windows in the car that move. My object in not putting a window in the side was in order not to have the working of the frame. Stationary glass, I find in the maintenance account, there is less of that than any other. I would be glad to show you gentlemen that car, which I believe is a car that nine months in the year is preferable to any other car. From June 15 to September 15 there is a question whether it is quite as inviting as an open car, but through those three months I have arranged to take the permanent glass out of one side of the car and to have a long curtain that is moved by the motorman or conductor and not by the passenger. This I believe will be taken better care of by having no one but the motorman and conductor to attend to it.

The President:—I do not suppose that Mr. Vreeland ever has to stimulate travel, but he may have to come to it. We would like to hear his ideas, especially how he gets along with advertising inside the cars.

Mr. Vreeland:—Mr. President and gentlemen, as your worthy president has said I am not engaged in stimulating travel. I am engaged in endeavoring to take care of what comes, and hardly succeed with that. The travel on Manhattan Island is a peculiar travel, differing from that of any of the street railroads of the United States or abroad, in that the average of the traffic for the day holds almost uniform, making it possible to run the same



number of cars all hours of the day, and most of the time a larger number in the evening. With the winter traffic having some 25 or 30 theaters on and close to Broadway, our traffic for a certain number of hours at night on account of the short distance will average more than it does for any hour through the day. That for New York City. On other lines with which I am and have been connected in an advisory capacity in other parts of the country where our people operate, we have found that a very large business can be built up through systematic efforts to stimulate and encourage the traffic. The consolidated traction system of New Jersey has a traffic which is very similar to that of the Brooklyn systems. It has a large number of public parks. It has beach resorts. It has the large traffic coming towards New York for Coney Island and such points to handle, and that road went to work a few years ago and systematically arranged to encourage the traffic on its lines. Its evening traffic was very light. Its Sunday traffic was a fair proportion, say a third or a half of the average week day traffic. By a series of special arrangements or through cars on several lines leading to parks and so forth, and by special advertising they succeeded in building up a business which the last two seasons has on Sundays and holidays exceeded the average daily traffic by nearly 100 per cent. The Atlantic Coast Line is the only line with which I have ever had anything to do where I recommended the railroad company to go into the amusement business. I do not believe much in it as a rule. I never did while I was in the steam railroad business and I think it is a pretty good application of the old saw—shoemaker, stick to your last. A man who operates his railroad, as our worthy president expresses it in his paper, out on the line and not in his office has got pretty much all he can do to attend to the average daily requirements of his business and watching to see that he properly cares for the average of business. While he is looking after this special amusement business he very frequently is running away from his 365 days in the year business—not giving it proper attention. But in this special instance there was a line that we extended to a shore resort where it was impossible to get any local people to take any interest in the line, because they did not want it there. They claimed that it would bring a lot of people there that they did not want. So we purchased all of the shore front and made a park, expended a large amount of money, put in merry-go-rounds and dancing platforms, gave firework exhibitions, and so forth. It was a peculiar business. There are 200,000 people along the coast that had absolutely nothing to do but be entertained, and they wanted to be entertained. They had money to spend and they wanted to spend it, and they did not know where to spend it, except in these local places. By opening up these lines and through the fireworks, special exhibitions, water exhibitions, and the like, if I recollect correctly in some six exhibitions that they gave they got sufficient extra travel to pay the interest of the money invested and the balance of the season it was to the good; and it meant a very large increase in the business, some 500 or 600 per cent to this particular point the first summer it was operated, and it has continued to increase until this summer it was simply limited by the track capacity and facilities of the property. On the Philadelphia system they went to work systematically to encourage the evening and afternoon traffic to the various parks. While they would not, as is our custom, engage in any direct amusement business, they lent their encouragement and aid both in advice and financially, to various enterprises around Philadelphia which has built up a very large late afternoon and evening riding, something which was never known on that property prior to those efforts. The same thing followed the efforts in Pittsburg and the various parks there and it was followed by a large addition to the business. As I said I never have advised or approved of a railroad company itself having anything to do with the amusement end of the business even if they want to lend their financial aid to it. I think that is a peculiar business that requires a peculiar tact and ability which the average railroad man who has given his time, attention and energy to the developing of himself in his own line of business does not possess, and if we go into these various lines of business we will reach that point that the president spoke of in his paper of a monopoly of everything and leave nothing for the other fellow to do. The general proposition of having some spe-

cial man to give special attention to these features is a very necessary point in railroad organization. It is just as much a part of a street railroad as it is of a steam railroad. I was connected with the Long Island system in its various ramifications in the early days when Manhattan beach was established, when Brighton beach was established, when Long beach was established, when Rockaway beach loomed up as any kind of a resort; and in the old days we were satisfied with going along in the old style and running a few trains to these various points. When there was new blood infused into the operating management of the railroad and a department created with men broad enough to consider these various questions and to put new ideas into effect, Manhattan beach, Brighton beach, Rockaway beach and Long beach grew in one summer, so that the company had to bring special trains from all points on the road to in any way handle the traffic at all, where before, as the steam railroad men know we would pick up at terminals a few extra cars. In the summer it was our custom to take every carrying equipment facility of the Long Island Railroad to handle it and with the character of advertising these places got it, has built up into what you see all along the coast. If that can be done by steam railroads I see no reason whatever why the street railroads, with the proper organization, cannot add very largely to their business and stimulate it. At the same time there is one point that has got to be carefully guarded. Some of the best lines of traffic that I have built up on various properties with which I am connected in an advisory way, has been accomplished by advising the manager not to pay any attention to the excursion business. Let the other fellow have it. He is running his cars for nothing but excursion business. He is not accommodating his regular short riders. You take that and let him have the excursion business and you will come out ahead. We have built up right in the city of New York on Sundays and holidays some of our best traffic. It comes from giving quick, short service and paying attention to it. There are some lines which are endeavoring to stimulate traffic to ride for five cents anywhere from 15 to 25 miles and probably bring them back if a fellow is smart enough to get a transfer. That thing we have endeavored to guard against and wherever we have had competition we have endeavored not to go too far into the excursion business. The history of the railroad on Long Island was one of giving the very best facilities, the best motive power, the best cars, the best service to cheap Coney Island and giving the poor motive power and poor service to the development of the central part of the system which meant 365 days a year business, with the result that within 25 miles of New York city the development has been so great that we street railroad men thought we would come in and help them cut their pie, and we have done it very satisfactorily, because they got their whole development within street railroad distances. Beyond that circle the average of traffic for the 365 days a year is very small and a concerted effort is now being made to develop the property that is outside of the limits or circle of electric operations. But I have no doubt that my aggressive and progressive friend Rossiter will have some of the 3-phase system before long and if we should have another war we will be carrying troops in from Montauk on electric cars and not leave it to the Long Island Railroad.

Mr. Cole: Mr. President and gentlemen: In cities of the second class we have conditions different from the larger cities. This spring in Elmira the Board of Trade held a meeting. The merchants were very anxious to promote excursions into the town practically for the traffic that they could get. They met with a complete failure as the merchants of the surrounding towns combined together and went to the railroads and represented that such excursions would be injurious to the smaller towns. The street railroads then took hold of the matter of getting excursions over the steam roads. We sent out men to the neighboring towns to confer with the different society organizations, which run excursions every year; and by representing to them the attractions of the parks and giving them the privileges of the dancing pavilion where they charge a nominal sum for dancing, the different organizations can run excursions and make money out of them, and the steam railroads would give them such rates that they would charge a little higher rate to each one going on the excursion so that the organization when they had had their excursion

would make a very fair sum out of it. In Elmira this summer we have had about five or six excursions each week, brought in by the steam railroads, and this has very largely added to the traffic over and above what we should have done by merely depending upon the local traffic.

J. E. P. Clark: It goes without saying that a provincial street railway is not affected in the same manner that the Metropolitan Railway System of New York is. We are not bothered to care for the trade that comes, but when we have struggled through a hard winter and come out in the spring poor, and the sun is shining on both sides of the fence and the interest account confronts us, it behooves the general manager to see what he can do in the way of stimulating travel. For the past ten years at Binghamton we have maintained two parks. We are unfortunate in having no beach and no lake. We are an inland city entirely. We have, however, a beautiful natural park, the property of the city, embracing 100 acres, laid out in handsome drives and a park which nature has liberally endowed with beauty and a great many other advantages. We arranged some nine years ago with the city, for a small sum, to furnish the amusement privileges, paying them a stated sum for the privilege and taking in return such privileges as we could run and reap a revenue from that were in keeping with the character of the place. We provided a merry-go-round and a large pavilion. We also provided a switchback railroad, popcorn stands, and the like. We engaged an orchestra of 12 pieces and we gave concerts every afternoon and every evening and have continued doing so from the inception up to the present time, and, we feel, with a very high degree of success. I think I am perfectly safe in saying that a road in a provincial city the size of ours for instance—we have a population of about 45,000 people, and most of our lines radiate within the city limits so that there is really only a certain amount that it is possible to attain by the simple operation of the cars, no matter how frequent or how excellent the service—for instance our winter months average probably from \$10,000 to \$12,000 in gross receipts and by stimulating the traffic by the operation of these parks we increase that to \$22,000 or \$23,000 a month during the five summer months. We calculate to open about the first of June and close the first of October. Our plan in running these resorts is to cater only to the respectable element and fundamentally to arrange not to incur too great an expense—keep it within bounds. At the Ross park we make a special feature of picnic parties. We provide there a dining pavilion, a full fledged kitchen with dishes and all appurtenances, so that parties can come there without burdening themselves with those conveniences. We have found that that has brought as high as six picnics in a day and five to ten thousand people at that resort daily is not an uncommon occurrence. That for a city of our size means greatly increased travel for those days. At our other resort, which is nine miles out of the city, for which we have a 25-cent round trip fare, we have what we call a casino and 30 acres of land. We provide there a series of entertainments which we arrange and control ourselves entirely as well as all the privileges, and we have been very successful there as well. We charge a slight admission for a chair only and unless the weather is exceptionally bad we have made the receipts for the chairs pay for the entertainment proper. We have found a great advantage in having an orchestra that we can furnish to picnic parties free of expense, or we can by changing a few pieces turn it into a brass band and furnish music for a parade. To make the receipts anything like adequate to meet the expense and interest account, the travel has got to be stimulated in this way, but I believe it must be done along respectable lines, and we have always made it the rule during nine or ten years to cater only to the respectable element, ladies and children in particular, because they are the only ones in cities of that kind that you can depend on in afternoons. Our experience has taught us that when you attract the ladies and the children the better element of the male gender will follow. I simply recite in brief our experience, and we feel that encouraging special attractions and providing for picnics and excursion parties has added largely to our exchequer and we believe we would not be in existence today if we had not adopted those means early in our history.

The President: I will ask Mr. Wyman, one of the original officers of this Association, if he will not give us some ideas.

C. D. Wyman: Mr. President, I may say that I am exceedingly pleased to be present. It is rather an unexpected pleasure not only on account of the pleasure it gives me to see as many as I do of the former members of this Association, but also the profit which I may get from the admirable paper which has been read and the discussions that have followed. As a former resident of New York I have taken naturally a very great interest in the development of the railways of the city of New York and Brooklyn, and I find so much of interest, so much to study and so much profit to be gained from such study that I count myself exceedingly fortunate as a dweller in a very far distant city where conditions are so entirely different from those that obtain here—I say I count myself fortunate to have been here. In the matter of suburban business of New Orleans we have traveled along very much the same lines that apparently the different railroads of the east have done. Some years ago, I think in this convention, a paper was read on a topic similar to the one presented here. If I mistake not I was the writer of that paper. I remember that I started out with a statement very similar to that made by our esteemed friend, Mr. Vreeland, that it did not seem to me to be best for a manager whose time necessarily must be so occupied in the actual every day detail of his road to attempt to engage very largely in amusement enterprises. But I have found that local conditions necessarily cause us to change what might be termed our regular ideas and habits very often, and we are per force of necessity obliged to adapt ourselves to some new developments in the surroundings of our company and therefore I have become converted in my own particular city to the necessities of managing and operating amusement enterprises. I have found it most difficult to lease these out to others because I have discovered that if you want to do a thing well it is a very good thing to do it yourself, if it is possible, and in our city we carry on an amusement enterprise of quite large proportions and as we control the major portion of the roads of the city, some 15 different lines, we used this particular enterprise not only as a source of income in building up the one special line that operates to it, but we use it as a feeder for all our other lines. It stimulates riding upon the other lines. It is, I think, a fair statement of fact that street railroad riding is after all to some extent a habit. Certainly pleasure riding is. It is but a few years ago when people did not in the summer go out so very much in the evening, certainly not in the south, and it has been our endeavor in that city to get the people out in the evening, get them to circulate about, to go distances and to go places of amusement; and we have found our enterprise to pay very handsomely. We provide a band of about 47 pieces, a band that ranks very favorably with Herbert and Sousa. We provide vaudeville entertainments, having had some very prominent artists there. Our pay roll runs from \$2,800 to \$3,000 a week for amusements, but it pays and our receipts are very largely stimulated not only on that particular line, as I say, but upon all the lines which feed it. We do not have transfers and it costs, therefore, sometimes, when one has to come from a distant part of the city, a little more than a single fare. But we charge no admission whatever to any of these entertainments. They are absolutely free and all that it costs one to be entertained, in a very excellent manner, as we believe, is simply the car fare, which is 15 cents for a round trip of about 12 miles.

The President: Before we leave the subject may I ask one question? Has any one here charged admission to their parks, and if so, what has been the result? Some I think started in to charge admission to those who did not ride on their cars but came on bicycles.

Mr. Vreeland: In the park we located at Pleasure bay, on our Atlantic coast line, being close to Long Branch, and out of the line of the direct route of the railroad, the majority came on bicycles the first year. The second year we arranged an enclosure at the entrance, put a man in charge to check bicycles free, and charged 10 cents admission to all who came on foot, by wheels or in carriages. On many nights when we had fireworks we had as high as a thousand bicycles in that enclosure. It is simply a matter of figuring how much in 10 cents that amounted to, plus the fact that this was a very fine point to drive to from all along the beach, and we had a great many carriages coming



there, and the second year we made an arrangement for the carriages by which we had sheds and had attendants in charge to care for horses, and we received quite a large revenue from that. That is the only instance in my experience where I know of a charge of that character.

Mr. Ely: Those who were present in Boston at the convention last week and visited the park at the end of the Commonwealth Avenue line visited a park where they make a charge for bicycles the same as that spoken of by Mr. Vreeland. They charge 10 cents admission, and in addition to that they charge for the checking of the bicycles. Last year they charged merely for the entrance and nothing for the checking. The number of bicycles has fallen off some, but Mr. Ahl, one of the gentlemen who control that road, informed me that he did not think that the percentage of loss was any greater than the percentage of loss in the number of bicycle riders. He thought that bicycle riding had fallen off—the practice, the habit—in Boston. This year it was less than last year. That park, it seems to me, is most admirably managed. They charge an admission of 5 cents to all persons—to those who ride on the electric road—and 10 cents to others. They have inside the park a summer theater which is conducted most admirably. The stage is built of rustic work, is open except at the top. There is a rustic cover some 18 or 20 ft. from the stage with dressing rooms, large and commodious, at either end of the stage built also of rustic work. No charge is made for the ordinary seats in the amphitheater, but a charge of 10 cents is made for the reserved seats, of which there are a few rows in front, also some boxes that are merely railed off with rustic work on either side of the amphitheater. The receipts from the reserved seats are more than enough to pay for the cost of the entertainment. The entertainment is provided in what seemed to me a novel way but most admirable and business-like way. One J. W. Gorman, an amusement manager of long experience, a very successful man, has organized a circuit of street railway park amusements, and has in his circuit about 20 places. Now that enables him to hire in the beginning of the season a large number of people of good talent and enables him to present a fresh bill of entertainment at each street railway park every week, so that the bill changes at every one of the parks having his companies every week, and thereby of course makes the entertainment much more attractive. The entertainment given is absolutely clean and is very inviting. The management of the park cater to the ladies and to the respectable element of the people. There is no beer and no stimulants sold on the grounds. Another feature is that they have quite a large number of animals, animals that will winter well in the New England climate. They took their animals through last winter without having a sick animal at all. They have them in large and commodious enclosures, and they are very inviting and attractive to children. They have another place where they have swings and piles of sand and things of that sort for the smaller children. There is no admission to any of these places. They have a very beautiful electrical fountain which cost them \$5,000 to install, and that plays in the evening during the intervals between the playing of the band and the performance of the actors on the stage of this theater. I may say that in addition to the other attractions they have a band of several pieces. It is a respectable band as to the quality of the music and as to the quantity it is immense. It plays so that you can hear it in Boston. The street railway fares amount to 20 cents. The 5 cent admission makes the quarter. The Commonwealth Avenue line is  $6\frac{1}{4}$  miles in length, and it absolutely has not anything with the exception of a few houses along the line except the park at the end. On Labor day they had more than 25,000 people there, and their attendance was brought about almost entirely by this park and the quality of the entertainment there offered. The railroad is a very paying enterprise; and the park is paying the interest on its investment and enough in addition so that Mr. Ahl said if they did no better it would pay for itself in five years. The park investment is about \$50,000; \$25,000 for the land and \$25,000 for improvements. They have a large commodious building, having a restaurant in the second story so

arranged with reference to the slope at the entrance that the lower part may be used as a resting place and shelter for cars. They have a lemonade stand and a place where soft drinks are sold, and that is a concession. They simply furnish the building, the same as the boat house and the place for the bicycles.

Mr. Cooper: There was a point brought out by Mr. Ely that I would like to call the attention of the small companies to, the provincial companies, as Mr. Clark calls them, and that is the interchange of amusements. I have a small park at home and I would very much like to put in some sort of amusement, but I found it would cost entirely too much for any town of 25,000 inhabitants to have vaudeville or anything of that sort. Several years ago I wrote to the papers calling attention to the necessity of having an amusement league, and I had some correspondence with smaller towns. I thought it a good chance while we are all here together to mention that fact and see if something could not be done in that way among the smaller towns having parks so that they could have that circle of amusements, giving a variety all the way through the whole season without extra cost to themselves.

Mr. Johnson: On that subject I would say that I have a railroad in Allentown, Pa., that run through 16 small towns. We have a park. We had animals in it, but we found the feeding and taking care of animals was far too expensive, and we are trying a different kind of animal now by giving a variety entertainment in summer time, and we get those shows from \$200 to \$250. We have a stage similar to the stage here, though somewhat smaller, and the reserved seats about pay for the performance. There is no liquor sold in the park, but just directly opposite this park, across the railroad track, we have a grand bicycle track and hotel, and in that hotel liquor is sold, our efforts being, as some one said here before, to cater to the better class of people, the women and children; but in order to answer just what he says, we have no trouble at all in finding performers, as there are organizations now that travel in and about Philadelphia, and Allentown being only a few miles away, that it is easy to get a company for anywhere from \$200 to \$250 a week, and we give an entirely free show every night except Sunday; then we have a band concert.

Our charge for reserved seats is 10 cents; no admission, and the fare on the car is 5 cents for any part of the distance. I notice some of you charge 25 cents and 15 cents for a round trip. There is a 5-cent fare anywhere on this line to that park. Our park is free to any one, basket picnics included. A man on a bicycle goes right in free. We have no checking of bicycles. Persons having bicycles have to take care of their own wheels. The bicycle business is very small at any rate. I hardly think it would pay a street railroad to cater to bicycles. Our half-mile track that we have been using for bicycles we are going to convert into a track for trotting horses.

The President: Is bicycle riding increasing or decreasing in the state of New York? What is the general voice of the convention on that subject?

Mr. Rossiter: I think it is increasing for practical use. A great many are using it to get to and from their business places.

Mr. Beebe: In our section around Syracuse, we hear less about it now than we did a year or two ago.

Mr. Powers: In the vicinity of Troy the hotels that have been furnishing dinners on Sunday to bicycle riders report that their business has very largely fallen off in the last year or two. I think that answers your question in regard to that locality as well as any statistics that can be had.

The President: Those reports are very encouraging. The bicycle has been our worst enemy so far. The next paper is by Mr. Cooper.

Mr. Cooper: The paper is not only not prepared but it is in pretty bad shape. I have to state that although Mr. Rogers gave me the subject in ample time I put it off. I was busy and then I was taken sick, so all I have to offer are just a few points on the subject with regard to the use of signal service on single track roads with terminals.

## SIGNAL SYSTEM FOR SINGLE TRACK ROADS.

By H. S. Cooper, Superintendent Schenectady Railway Company.

With the increase of interurban electric roads, where the cost of double-tracking is prohibitive, a system for handling cars, either singly, in trains or in sections, with safety, accuracy and speed, becomes a paramount necessity. On single track urban and suburban roads where the narrowness of streets, the opposition of contiguous property owners or other causes will not allow a double track, the necessity is not generally so great, but it exists.

The use of any such system on single track roads with turnouts is primarily for safety, to prevent collisions between cars or trains running on that road. This freedom from collision will have a secondary effect, in that it will allow a more accurate maintenance of schedule, a smaller headway and a greater speed. As a third result, such a system may be amplified so as to include grade-crossings and other dangerous outside places, and also to correct schedules when disordered by accidents or "rush-trips," or special cars. Where an electric road is similar in conditions to steam roads, and where its traffic will warrant the necessary outlay, steam road signal and safety systems may, of course, be adopted, but many electric roads, urban, suburban and interurban, are not conditioned like steam roads, and other systems must be used not only on account of the different conditions, but principally because installing, operating and maintaining such a system would be prohibited by its cost.

Any system must, of necessity, be governed in its details by local conditions of speed, schedule, turnouts, geographical, topographical and climatic conditions, etc., but in all cases a reliable signal system must have certain characteristics to make it successful.

1. It must be reasonable in cost, both of installation and maintenance; for, although anything is cheaper than collisions, there is a limit of expenditure in every department where the very best results obtained are negative ones, where unknown circumstances and local conditions so largely govern the causes, and where there is absolutely no real basis of comparison as to results from time to time.
  2. It must be simple in construction, operation and maintenance.
  3. It must be frost-proof, sand-proof, dust-proof, mud-proof, sleet-proof, sun-proof, snow-proof, water-proof, oil-proof, weather-proof—in fact, it must be almost element-proof, nothing but outside human violence or extreme and violent action of storms, floods or fire should be able to disarrange it.
  4. It must be proof against ordinary tampering, whether the same be curious or malicious, it being understood, of course, that nothing human is proof against determined intelligent violence.
  5. It must be absolutely incapable of giving wrong signals from any cause not directly human and malicious.
  6. It must be "positive," i. e., it must be a signal only when it operates correctly, and when, for any reason, it fails to so operate correctly, it must be unable to give any signals, and must give unmistakable evidence of the fact of its being out of order.
  7. It must be capable of being used as a signal between any two points at any time.
  8. It must indicate both "danger" and "safety."
  9. It should be recording or registering, i. e., it should record or register (or be the means of recording or registering) any and all uses of it, and if found necessary in practice, it should also register or record any non-use of it at a time when it should be used. Further, it should, if possible, be humanly selective enough to record its own signals, and to record or indicate in some way, who does or does not use it.
- Such are the most prominent needs of a successful system. Now let us look for the circumstances which call for the use of such a system, and we will then be able to judge intelligently of the merits of any system we may propose to examine.
- The uses of such a system would be:
1. To prevent collisions between cars, trains or sections on a single track road, or on a certain section of such a road.

2. To prevent collisions between the cars of that road and of other roads crossing at grade, or to protect any grade crossing, whether of another railroad or of a highway or street.

3. As a despatching system, to modify, to change or to correct a schedule.

4. As a means of communication between any two points on the line, or between any one point on the line, and one or more points away from it.

We will examine only number one—the prevention of collisions on a single track line, or sections of it, for if it will fulfill all necessary conditions there, it will do so in the other three cases. Collisions will occur either at turnouts, termini or on the main line. On turnouts they will be as follows:

- a. Where the "standing" car, or the one on siding, or the one not having right of way is not "clear," and is struck by the "running" car in passing.

- b. Where the "standing" car runs out of siding before the car running by is "clear."

- c. Where, through a misplaced or mishandled switch, the running car takes the wrong track and collides with car thereon.

- d. Where a later section runs into a head section waiting at a siding.

At termini the collisions will be identical in character with those at turnouts.

Now, if we carefully examine all these cases, we will see that with one possible exception (collision of sections at sidings), the only possible collisions at either sidings or termini are due to carelessness or negligence, which occurs within easy range of either vision or hearing of the points neglected. They are, therefore, of that character where no signal system would be of any possible use, and we may virtually throw out of our calculations as needing a signal system all collisions at turnouts or termini except those between sections; therefore, so far as prevention of collision is concerned, a system is only of real use when the cars, trains or sections are on the single track "main line" between turnouts or between turnouts and termini. Collisions on this main line consist of:

1. "Running" head collisions where both cars are running, and in opposite directions.

2. "Standing" head collisions, where one car is running and the other is standing still, coming to a stand-still or starting to back away, both cars having been previously running in opposite directions.

3. Standing rear collisions, where one car is running and the other is standing still, coming to a standstill or starting up, both cars having been previously running in the same direction.

In addition to the above actual collisions, there are those where the cars, trains or sections fulfill all the conditions of a collision except the actual "smash." These "ghost collisions" must be classed as "actual" as they are nearly as demoralizing, show equally as well that "something is wrong," and are to be avoided if only on the principle that it is as bad to scare a passenger to death as it is to kill him. An analysis of these collisions shows that they must be caused by one or the other of the following:

1. Curious or malicious tampering with orders or signals, or line.
2. Recklessness of employes.
3. Direct and willful disobedience of employes.
4. Negligent, careless or ignorant disobedience of employes.
5. Defect of senses or bodily ailment, or disability of employes.
6. Misunderstanding of running rules, orders, signals or schedule.
7. Accidental disagreement of time pieces.
8. Wrong orders, rules, signals or schedule figures.
9. Weather or climatic conditions, such as fogs, blinding storms, heavy snows, etc., etc.
10. Topographical conditions, such as bad curves in cuts or otherwise hidden, heavy grades, especially if leading into or out of curves, turnouts or termini.
11. Defects in track, overhead lines, car machinery or loss of current.
12. Previous accidents at some unknown point in front.



Now take the signal system as previously outlined. It is much more perfect in theory than any one at present is in practice; and see how many of these causes of collisions it would of itself obviate or prevent unless it were supplemented by good men, good rules and good discipline, and the personal human element is directly responsible for more of them! Your signal system must supplement your men, not supplant them; must simplify their duties, not multiply them; must decrease their responsibilities, not increase them. It must co-operate with the running and safety rules, not supersede them. It must be an auxiliary to both men and rules, subordinate to them, for the "personal element" should always be the principal element, and the rules must be an expression of and a guidance for it. But, alas, where is the "good and reliable system?" One that fulfills all the ten conditions previously noted. It certainly is not among those that are automatic and are worked by the contact of the trolley, or of some projecting part of the car, or by the weight or impact of the car itself, or by some mechanical or electrical thing attached to the car—they will not truly fulfill a single one of the 10 conditions. It certainly is not among those which either the conductor and motorman "set" as they pass it, and which give visual signals over a circumscribed portion of the line, for I have tried them in every possible combination and condition, and they fail in the most necessary particulars. Is there then such a system? I think there is, and I am pretty certain, moreover, that it will fulfill most of the 10 conditions. It is simply a telephoric dispatching system.

Mr. Powers: It has been my fortune, or misfortune, to operate only single track roads with sidings or turn-outs, and for that reason this paper has the very greatest interest to me, particularly as I have just about completed a rapid transit road about 12 miles in length, a road on which it is not necessary that speed should be made in order that money may be made, as the population of villages is but small. Now the first thing to be looked for of course, in the direction of safety, is to cut down the number of switches on the road to the absolute necessities of the line. So long as you multiply switches you multiply danger, for if your motorman knows there is a switch a minute or two ahead of him and he finds that the car is not at the switch at which he intended to meet it, the temptation is always to make the next switch. We have simplified that on our line by putting in only so many switches as the actual schedule requires, and making it the first rule of the road that a motorman who leaves his switch without passing a car, except on telephone orders from the office, gets his final and absolute discharge. We do not allow a motorman to run by a switch under any circumstances whatever. If the telephone line breaks down he stays there until he gets an order. That may sound like blocking traffic. It does. It limits the schedule capacity of the road and therefore, as we dislike very much to use the system of double heading the cars and only do it under pressure, we have gone to the other extreme of enlarging our cars to the extreme capacity. We are using open cars seating 90 passengers, 15 bench cars, six passengers on each bench, and carry frequently 135 to 150 passengers on a car and in that way we accomplish upon a comparatively limited schedule a good deal of business. But the needs of the situation are growing in the direction of some safe system of signalling and safety blocking upon electric railroads. If we could devise, or have devised, for us a system by which it would be impossible for a car to enter upon a block where a car was already, without becoming derailed, so that when a man once made a mistake of that sort he would have no further opportunity for making it, that would be the system that we should all like to adopt. But I must say I have not been able to find anything in the nature of signalling that has offered sufficient inducement for me to put it on this new line, and my only remedy so far has been to put in force this absolute rule of discharging the motorman if he leaves the switch on which he has to meet a car except on orders from the dispatcher.

Mr. Johnson: In regard to the signals, on our Allentown road we have a system of signals. The conductor turns a switch and it throws a light on at the point where he starts, and also shows the danger signal at the other switch. When he arrives at that

switch he throws that light off and we have that on every switch on that line. I think that Mr. Drake, our general superintendent, who is here, was the first to put that signal on. I have never seen any other. But on that entire system of 50 miles of road we have a signal at each switch. It is the duty of the conductor to put the signal on before leaving and to take it off when he arrives at the second switch.

Mr. Cooper: In regard to the system Mr. Johnson speaks about, I tried that a number of years ago and while it is good when properly carried out it wastes an enormous amount of time. What we want is something that will save the time and bring the schedule right back to where it ought to be in case of accident and trouble. You can get up plenty of signal systems for orders, but you want something that will bring it right back and save time.

Mr. Johnson: He changes that signal while the car is simply passing slowly.

Mr. Cooper: That is all right so long as things are working properly, but when anything gets out of order you want something to dispatch the system.

J. P. E. Clark: I would say for the information of the gentlemen that we are using on our union extension in Binghamton the same signal Mr. Johnson mentioned. We have had it in practical operation three years and it works very nicely. It does not agree with Mr. Power's theory, however. To work it successfully frequent turn-outs are an advantage. We have frequent turn-outs and we find it works excellently, and all who have seen it in operation have pronounced it a good thing, and I think I could say that I could safely recommend it.

Mr. Ely: What speed per hour do you attempt to attain?

Mr. Clark: We run between those switches about 15 miles per hour.

Mr. Cooper: What is the exact operation of the system?

Mr. Clark: As he says it is, a conductor coming to a switch and if he finds that it is clear he cuts in the red light, which throws a red light on the switch ahead of him, showing that a car has left the switch just ahead of him and he has to wait for it. Then they both pass on that red light.

Mr. Cooper: Suppose the system is out of order?

Mr. Clark: It has not got out of order with us. It is very simple.

Mr. Cooper: It is liable to get out of order.

Mr. Clark: Of course it is not infallible; it is liable to get out of order. In our three years' practical experience we have not had any difficulty in that line. It has worked well with us for three years in every day operation.

Mr. Powers: I should say that the speed on this line we have in operation is 18 miles per hour, including stops. That means running through three villages. Between villages the speed will run 30 to 40 miles per hour.

Mr. Clark: We are particularly fortunate in that respect, because through the thickly populated portion of the city we have a double track.

Mr. Johnson: Have any gentlemen here ever ridden on the road from Cleveland to Lorain? I have never ridden on it. The president of the Johnson Company told me that it runs 50 miles an hour on that road. They have a telephone system. The conductor at the switch telephones. I have not seen that system. I know that on one little road running from Lorain to Elyria the schedule time is 40 miles, although that is a double track road. The other is a single track road that has a telephone system and runs 50 miles an hour.

Mr. Ely: Concerning the Cleveland and Lorain they had a very disastrous collision on that line less than six weeks ago, and on the same day on the other side of Cleveland, on the Cleveland, Painesville & Eastern road they had a very disastrous collision. So far as high speeds are concerned Mr. Littell and myself are connected with a road that has just been put in operation between Buffalo and Lockport. The equipment is the same as the Cleveland and Lorain. We have large cars heavily equipped. We have four G. E. 57 motors on each car giving a horse power in the aggregate of 208 for each car. Those cars are geared to run 60 miles an hour. We have actually run as high as 55. But we are giving a half hour service between Lockport and Buffalo.

That increased the number of train units to such a degree that it makes a problem extremely hard to satisfactorily solve. We would have 62 trains a day, 31 each way. Such a number of train units as that I think Mr. Vreeland and Mr. Rossiter would say prevents operation at high speed upon a single track road. Now 15 or 18 miles may do. But my judgment is from the short time we have had the Lockport road in operation that the only safe way to run at high speeds like that, on a single track road, is to double track it, and double track it quick. (Laughter.)

Mr. Rossiter: We built some three years ago a five mile extension to the village of Flushing, which has some 12,000 inhabitants, and the question was very carefully gone over by myself as to whether it would be expedient to build a single track road. We did not want to put money into the double track, but it took me very little time when I looked into it to make the double track road.

Mr. Powers: I did not feel warranted under the conditions to put in double tracks, but we purchased the right of way for it and made provisions in our financing to put it in afterwards.

J. P. E. Clark: I would say that the signal system I mentioned is not without its disadvantages. A car which happens to get off its schedule time is unfortunate in not being able to get back on it, because it is always just behind the block. That is one disadvantage we have discovered in the operation of this system. I fully agree with Mr. Ely that where cars run on short headway and at high rate of speed that the double track is the only safe signal system you can adopt.

The President: If there are no further remarks on this paper we will have one by Mr. Fenner before we adjourn for lunch, on "By-Products of Power Stations."

M. M. Fenner: I probably represent the smallest property and smallest capitalization of anybody here. I do not know that I should blush to speak about our little affair after hearing representatives of great properties here. For instance it was a horse road between Dunkirk and Fredonia that succeeded a 'bus line in 1866 and in 1891 it was converted to electric power. In 1893 we had our best receipts from passengers. Passenger receipts have been on the decline since. In that year they were about \$23,000. The passenger receipts are a little less than \$18,000. Some reason for that is that we have a pleasure ground half between Fredonia and Dunkirk, the distance of which is three miles between the two towns, and that unfortunately got into litigation and after 1893 was not used until recently. Then the bicycle business came on and hurt us exceedingly, and then the city of Dunkirk is chiefly dependent on the great Brooks Locomotive Works and a good many people live in Fredonia and work in Dunkirk, and since the panic of 1893 that concern has been running light until recently and the business fell off there. One of the chief sources of our receipts is the cemetery in Fredonia. (Laughter.) Fortunately Dunkirk unites with us in the cemetery, which is located in Fredonia; and when anyone dies in Fredonia, who has perhaps never ridden on a street railroad, that individual becomes a good customer of the road and it makes a great deal of difference to the railroad whether he is tenderly remembered or whether he is not; it makes a difference in the receipts. Well, you can see we have had to resort to other means. While our capitalization has been a little increased, although small now, at the same time we could not pay dividends on that, so we had to look into by-products, and what I have to say here is on exhaust steam which has, and still, keeps us on a 6 per cent basis.

Mr. Fenner then read the following paper:

#### BY-PRODUCTS OF THE POWER HOUSE.

By Dr. M. M. Fenner, Secretary, Treasurer and Manager of the Dunkirk & Fredonia Railroad Company, Fredonia, N. Y.

The past eight years have witnessed a practical conversion of the surface railroad mileage of the country to electric power. This has also been a period of wonderful activity in the way of extensions and new constructions of these roads. Patents

and new plants for the manufacture of construction material, as well as continual developments from the crude to the more perfect, have rendered new construction expensive, while the enormous cost of conversion has added immensely to capitalization.

These increased facilities have brought increased patronage, but not always sufficient in amount to give an adequate return on the augmented capital.

This situation has made it incumbent on managements to look for further increase of revenue to meet the falling, or decreased, dividends. The establishment of parks, picnic grounds, dancing pavilions, and other pleasure resorts have had attention, and in many cases brought most satisfactory returns.

The question of by-products has also received more or less attention, and under that head I desire to present my experience for four years in the utilization of

#### EXHAUST STEAM.

During the year 1891 the Dunkirk & Fredonia Railroad Company changed from horse to electric motive power. The road is three and one-half miles long, with offices and power house situated centrally in the village of Fredonia, the village having a population of about 4,000. Its traffic is to the city of Dunkirk, having about 12,000 population, and to the Lake Shore and other trunk line railroads. It runs half-hour trains from 6 a. m. till midnight.

Its capitalization, while a horse road, was \$57,000; through fare, 15 cents; it had no debts and paid 8 per cent dividends.

During the legislative session of 1894 the company secured an amendment to its charter (which was a special charter granted by act of legislature of 1894). This amendment empowered the company to produce and sell light, heat and power to the village of Fredonia and also to the corporations and citizens residing or doing business in the said village; also to rent such of its buildings as it did not require for its own use, and supply its tenants with light, heat and power.

The previous year, 1893, the company had sold its exhaust steam for the purpose of heating the Hotel Columbia, a new and large structure being erected immediately across the street from the company's power house. This sale was in perpetuity, and the consideration was \$250 a year. By the terms of agreement with the hotel, the company could only recover its exhaust steam by paying the hotel company the price of its plant (\$2,750), required to convey the steam to the hotel, and after a six months' notice. This hotel system was put in in the fall of 1893, and operated during the season of 1893-4. It was found to be a flat failure and the railroad company was compelled to heat the building with live steam injected into the exhaust with sufficient pressure to compel a circulation. By the contract any live steam required was to be furnished at cost, and the company received \$300 for the season on a settlement, which did not more than half make up for the cost.

The contract specified that the exhaust steam was to be taken by suction in such a way as not only to cause no loss or annoyance to the railroad company, but that it would be an actual benefit, in that it would take off the natural back pressure incident to exhaust steam escaping in the air. It appears there is a heating system that proposes to do this. It was the representative of this system who accompanied the hotel interest when the contract was arranged. But finally that system was not used, another one being installed without notice to the railroad company, which latter system required the operation of a 4-h. p. engine to pump the condensed water back from the hotel. The iron pipe in the system used was encased in vitreous sewer pipe, and by the time the system was ready to operate it was filled with water, making a condenser for the exhaust steam. The hotel contract had never actually been executed and the season's trial placed it out of the question.

The railroad company, during the summer of 1894, began a search for further income to satisfy its new debt and increased capitalization with a fare at the time reduced one-third, or from 15 cents to 10 cents, and fell upon an investigation of the different heating systems, of which it found several. We had already had sufficient experience with the one system connecting us with the hotel. We also appealed to the experience of others. I



remember making a visit to the president of the Buffalo Electric Lighting Company, a business man of high standing. He told me his company had been in the business of heating for several years, but it was most unsatisfactory. He asked me to look out of the window and see the steaming ridge of earth crossing the street. He said that was his exhaust steam on its way to heat a building. He wished he did not have a contract left. He had lost a good deal of money at it, would not renew any contracts; had to heat all out of doors. "No," said he, "don't try it. Get your money out of light and power, or anything else, but don't try to get any out of exhaust steam. You may," he said, "succeed in heating your power station with it, but don't try to go farther."

Now, I confess this was a black eye, coming, as it did, from one of Buffalo's brightest and most active business men, that temporarily set aside my hopes. I suggested that probably that he had not selected a system of heating that would "insulate heat." I told him then of the claims of the system I was then studying, made in that line, and I also told him of the notable failures of our hotel heating of the previous season, which I laid to bad insulation and improper construction. But this had no weight. The simple fact was there was not any way of doing it so returns would be satisfactory.

The heating company whose system I had under investigation then gave me references to companies where its system was in profitable operation, and I needed their encouragement, after visiting Buffalo. Pursuing the matter, I got enthusiastic reports from Springfield, Ill.; Cedar Rapids, Ia.; Williamsport, Wilkesbarre, Scranton and Phillipsburg, Pa.; as well as from the users of the Holly system, of Lockport, N. Y., its home patrons. The result was, our company went on and had the heating plant installed, and also an electric light and power plant during the summer and early autumn of 1894. The light and power additions to our plant made more exhaust steam, which, added to that from running the street railroad proper, gave a quantity sufficient for all the heat consumers we were able to get during the milder heating months, like September, October and a part of November, also a part of March and all of April and May. During the remainder of the season the exhaust steam has to be reinforced from the boiler.

From a capital stock of \$57,000 in 1891, our capital has increased to \$116,200, and from the no-debt of the period we have a bonded 5 per cent debt of \$61,000. Also our through fare was reduced immediately on the installation of electric power by one-third, and yet we are able to pay our fixed charges and 6 per cent on our increased capital. This is a showing that could not have been made had we not utilized our exhaust steam. In fact, our report to the State Comptroller has for several years shown a 3 per cent dividend from railroad operation and a 3 per cent dividend from manufacturing (which, interpreted, means, sale of exhaust steam), making 6 per cent in all. The almost perfect system of insulation that we use enables us to market the by-product of exhaust steam, in competition with anthracite coal, with all its cleanliness, conveniences and advantages. We sell it on a basis of \$4.17 for best anthracite coal, and our consumers think it is fine and cheap. It is usually sold on the basis of \$5.00 for anthracite coal. We sell by meter.

Exhaust steam is no different from any other steam of equal pressure. The most economical pressure for heating purposes is understood to be from 4 to 6 lbs. When the exhaust is not sufficient to give that pressure it is easy to reinforce it direct from the boilers to such a limited extent as needed.

Some of the questions we stumbled over were as follows:

1. How can we make steam at a pressure of 4 to 6 lbs. circulate long distances, and through a net work of pipes in large buildings? We had the State Normal School to heat, having nearly 1,000,000 cu. ft. of space, and other large buildings. In the Normal School they had been heating at a pressure of 40 to 60 lbs. of steam by means of radiators in one part and a fan, driven by an engine, in another part. The answer is: Condensation is all the while occurring in the pipes, reducing the pressure, thereby creating a vacuum which draws the steam on to fill it.

2. How do you dispose of the water from the condensed

steam? Answer: By letting it return at proper grade through the steam pipes to a cooling coil from which indirect heat is secured, the cooled water finally escaping through the sewer. Or, if the building be too small for a cooling coil to be profitably employed, then it returns to the street mains and goes from them either directly into the sewer, or passes into some heated building farther down the line, and through its cooling coil to the sewer, after parting with its indirect heat. A special trap is indispensable to prevent the steam escaping to the sewer.

3. What effect will the back pressure have on your engines? Answer: No serious effect. The 6 lbs. of pressure will neutralize 6 lbs. of the 80 lbs. of steam you run at. It will then require an additional pressure of steam equal to the back pressure in the pipe line less about 1 lb. the pressure when exhausting in the air. If the back pressure was suddenly removed the effective pressure for the engine would run up a number of pounds equal to the back pressure, less the 1 pound.

4. How much more coal will this back pressure consume? Answer: Not much, hardly noticeable in the coal pile. I experimented in 1896. Our large hotel, a consumer during winter, wanted hot water in the summer. What would it cost? I wrote the Springfield, Ill., company for its experience. Our business in summer can be done with a 150-h. p. boiler. Springfield replied, I ought to have \$75 per month. But they would rather lose customers, and have lost them, than keep the steam in the pipes during the summer.

I had the coal weighed for back pressures of 1, 2, 3 and 4 lbs., and compared it with the consumption when exhausting into the air.

At 1 lb. there was no difference.

At 2 lbs. there was small difference.

At 4 lbs. it cost about \$15 per month with soft pea slack at \$1.50 per ton.

That was the price I fixed. But since that year we have metered it to the hotel, and it costs only about \$6.50 to \$8.50 per month. They need a pressure of from 1 to 2 lbs. in the main, 4 lbs. occasionally. We think it a benefit to the system to keep the steam in the pipes summer and winter. There is a little oil in the exhaust steam the separator does not remove, and it keeps the pipes and meters bright and clean, and the contraction and expansions are avoided. Most people like to take the chill off the air in the damp summer weather, and will use the heat if the meter is left in. We take meters off after the season is over for repairs and repainting, except when consumers desire to use some steam in the summer. In those cases we leave them on.

We found the system profitable and most satisfactory, in every detail. For instance, our State Normal School had never passed the winter without dismissing school more or less on account of cold days, until we began heating them; they have never had to close since for the want of heat. During the exceptionally cold season of 1895-6, Dr. F. B. Palmer, the principal, told me his was the only one of the 15 Normal Schools of the state they had not closed for lack of heat. It having become quite widely understood that our company is operating successfully a steam heat plant, whereby it profitably uses its exhaust steam, much correspondence has been entailed upon me in explanation of the plant. It is, therefore, a relief to make a general statement at this time for all interested, which it is hoped will save much time in the future. The system that will insulate this by-product of power, exhaust steam, and permit its 960 units of latent heat per pound, otherwise lost, to become available as it condenses into water, cannot fail to be a success if it will work. That it will and does work is abundantly proved by the experience of our company, as well as that of a number of others that might be named throughout the country. As such, I might name some of whom rendered me important aid and encouragement by their counsel, when in a state of doubt, the following:

Springfield Electric Light & Power Company, Springfield, Ill.

Danville Gas, Electric Light & Street Railway Company, Danville, Ill.

Terre Haute Electric Railway Company, Terre Haute, Ind.

St. Joseph Electric Railway Company, St. Joseph, Mo.

Cedar Rapids Electric Light & Power Company, Cedar Rapids, Ia.

Electric Railway Company, Burlington, Ia.

The insulation consists of an iron pipe to contain the steam. That is placed on rests 1 in. high in the board log, the bore being 2 in. greater than the pipe, so as to give 1 in. of dead air all about the iron pipe, which is wrapped with asbestos. The log has a shell 4 in. thick, lined with tin, which has been submitted to materials to prevent water soaking and decay. This again is covered with three-ply tarred roofing felt, and laid on a board at the bottom of the trench, expansion variators done away with all packed joints, are inserted at proper intervals with brick work built above them, special protection at end joints of the logs where they fit into each other, and the whole then covered with earth specially tamped down, proper drainage tiles being placed beneath the structure to take away surface water. While this insulation is not absolutely perfect, it is practically so, and makes it possible to circulate the steam for long distances in proper sized pipes without heating all out of doors, as the Buffalo business man consulted alleged to be the case.

The president of a western plant wrote me, under date of July 24, 1894, as follows:

"In reply to your letter of the 17th, our experience with the Holly system of steam heating, of Lockport, N. Y., has been entirely satisfactory. It has also proved satisfactory to our customers, and it has proven a profitable investment to us, as it does not require any additional labor or expense to keep it in repair or to operate it. We utilize the exhaust steam from the street railway engines from 6 a. m. until midnight. Our company has a contract with the city for lighting the streets, and we use the exhaust steam from the lighting engines from midnight until morning. Our plant cost about \$40,000, and is bringing us in a revenue of about \$10,000 per year, \$8,000 of which we believe is clear profit. If your power house is located close to your customers, you certainly can make it profitable."

This was among the evidence that induced our company to put in the plant.

I. B. Smith, secretary Cedar Rapids (Ia.) Electric Light & Power Company, has written me that the company put in the system we use; that it has under contract the exhaust steam from another plant; that the power house is some distance from the point of distribution, over a mile, and that it is getting satisfactory returns on the \$50,000 plant. In his letter of July 18, 1895, he says: "Our back pressure varies from 5 to 12 lbs., according to the weather; and we are able to carry steam to the extremity of our mains, the farthest point being somewhat over a mile from our plant, and to heat satisfactorily our largest blocks and buildings." He says further: "The steam is popular, clean and convenient, and always to be had in abundance."

As previously stated, we pay 3 per cent from our street railroad earnings proper, and 3 per cent from our steam heat earnings, upon our whole capitalization. Thus we owe it to the steam heating industry that our electric railroad corporation is on a 6 per cent basis.

The growth of the heating business is shown by an increase of receipts from \$2,800 in 1894-5, to \$4,500 in the season of 1897-8. A satisfactory number of new customers have already made application to connect with our mains for the season of 1898-9.

The heat is sold by the sq. ft. of radiator surface, by the cu. ft. of space heated, by meter, and at flat rates, in the various localities where it is used. We adopt and prefer the meter. We think it would be as wise to sell gas and electric light on flat rates, as to sell steam heat. I can say, with Mr. Smith, of Cedar Rapids, Ia., that the steam heat is clean, effective, cheap and popular, and always in sufficient supply. The amount of heating which a power plant may be able to do with its exhaust steam, can be closely approximated by the following rule: That the exhaust steam from 100 h. p. of engines when in use will heat 1,000,000 cu. ft. of space in average buildings in the severest weather. This rule is believed to be substantially correct. This method of heating is adapted to all kinds of buildings, whether dwellings, stores, offices, churches, or public buildings. During the certain hours when the supply of exhaust steam may be insufficient, there is a good profit in the supply of live steam, with which the service is supplemented, for the reason in part, that the men and boilers are already at hand, and it is better for

them to be steadily employed than to be idle and unproductive a portion of the time.

The President: Although Mr. Fenner says his is about the smallest road in the state, it occurs to me that the smallest road often requires better management to pay six per cent than some of the larger roads. But in Mr. Fenner's paper he states that they lease power, and so forth, and that is a little joker, I think. The large roads are unable to get special legislation whereby they can accomplish those effects. I think the paper is worthy of discussion, and I hope we will hear some, because there are opportunities where we can increase our earnings outside of passenger receipts.

Mr. Fenner: I think anybody could get legislation for heating purposes. We have no right to use power in Dunkirk, but we use it all the while because we are not in opposition to anybody. By common consent the city council permits that. We could not sell electric light.

The President: Mr. Clark, you have had a great deal to do with the electric railways of this country in other states. May I ask what is the usual law? Do they allow them to light cities and sell power and heat?

W. J. Clark: It depends entirely on the provisions of their franchises or charter. Very frequently you will find in some of the cities that the lighting and the railway companies have combined. There are some very large instances, notably the Milwaukee Electric Railway & Lighting Company, which practically has control of all the street railways as well as of the electric lighting of that city. I think it will be found that in the New England states the electric lighting people generally have been very careful to see that electric railways did not get the right to do electric lighting. In the west a great many instances of that kind have been found. I think that wherever it has been tried in the smaller cities and towns—the combination and transportation interests—it has been found to work advantageously, producing economies which would be impossible in running two small systems independently.

Prof. R. C. Carpenter: I listened to the paper with a good deal of interest, and it has struck me that there were a good many conditions which might make the heating profitable, and again in other cases might not make it so profitable. One of those conditions depends very largely on the nature of your power. If you have an economical engine, a compound condensing engine of the best class in which you can get a horse power from two to four pounds of coal on the one hand, and on the other hand if the engine requires six to 10 pounds of coal, as some do, it would make a very great difference as to the amount of saving whether you can do the heating or not. With the economical engine you cannot save very much by your exhaust steam heating. With a non-economical engine, on the other hand, you could save a great deal. I think such conditions as these would have a good deal to do in deciding the question whether it is economical or not. Taking Ithaca, and also Cortlandt, N. Y., we have united the lighting with the railroad service, and in both these towns it has been very advantageous. I do not know how we could have kept our power house expenses in reasonable limits and made any sort of profitable showing unless we had them united. There was no difficulty whatever in making the necessary combination. In both cases it is a combination of two companies, however, rather than one company having two functions.

Mr. Cooper: What distance can steam be carried with economical results?

Mr. Fenner: We have perhaps a mile of pipe line, and there is not any part of the line any more than one-third of a mile away from the power house, so ours would not be a very good test. But at Cedar Rapids, Ia., they run over a mile before they get to the point of distribution and then heat satisfactorily. With reference to the practicability of the steam heating I think there would not be any difficulty in any railroad company in the state getting its charter amended so as to do steam heating. The people of the towns, the small towns particularly, would aid them as they did us. The village council of Fredonia aided us in getting our charter amended. We were not in competition with anybody, and where that is the case you can easily get it. Now



we could not ordinarily get light. We could not have got light for Dunkirk at all. We did not get anything for Dunkirk. But with reference to light in Fredonia, we happen to have very poor gas. The gas is made in Dunkirk, and it was being drawn by a suction pump to Fredonia. That would let a little air in and we had villainous gas, so there was a great call for light, and the trustees wanted to buy electricity of me to make light. We went to the gas plant and asked if they would not put in an electric light. They did not care to but said they would not oppose it. The trustees helped us to get our charter amended, not only for heat but also light, and as a matter of fact it had the effect of taking some of the best customers away from the gas company and spoiled their plant, and about a year ago we bought it, so that we run gas now as well as electric light. The amendment to our charter did not state electric light but simply said "light," and we bought the gas plant. Now we run gas and electric light and steam heat and power. The power and the steam heat are not in competition with anybody. We bought the gas plant, so we are not in competition with anybody on that. I know you could not get the right to make light, but you could get the right to use each system. We could easily move our power house to the bank of a stream where we could have a compound engine the same as they had in Jamestown, the neighboring city. I have talked with them about this heat business. They thought they could not make anything out of it because their power house is a quarter of a mile from the point of distribution and they use compound engines. We did not use compound engines at first because our plant was too small. It is large enough now to use compound engines economically. But there you only save, I understand, about 25 per cent. Now this exhaust steam is worth 100 per cent. So we could not afford to change, and if we were already changed we could not afford to operate. Some of the plants I have mentioned are not running with exhaust steam. Wilkesbarre is not running with exhaust steam, nor is Scranton. The same is true of Lockport. They run with live steam. Some of them go as far as two or three miles away. They make profit in selling live steam. Now, of course, if it would pay expenses to take live steam, the exhaust steam you have is worth its weight in gold. It is as good as 100 cents on the dollar, and we could not afford to use a compound engine and only get 25 per cent out of it.

Prof. Carpenter: Just one other question regarding the loss which occurs from exhaust steam mains. I have made two or three tests of several existing plants in Cornell University that sent steam half a mile from the power house in order to heat our buildings, and I have tested the losses which occur in that plant. I also tested a plant which the Lehigh Valley Railroad Company put handling coal a short distance west of here in New Jersey a few years ago. I found that with the best insulation the losses could be reduced to about one-fifth of what would occur if the pipes were exposed to the air and suspended above. Now you can usually count in ordinary conditions of weather and wind that about one-third of a pound of steam will be condensed in the air for each square foot of exposed pipe. You can insulate your pipe without excessive cost so as to reduce the loss to about one-fifth of that. That is pretty good insulation, however. A great deal of the insulation will not reduce the loss to more than one-third of what would take place. I think in that way we can figure pretty well what the loss is. I might also say that there are two companies in existence now who are doing exhaust steam heating and carrying steam a long distance at less than atmospheric pressure and making a success of it. So that it is entirely practicable and possible to do this kind of work without bringing an excessive back pressure on the engine. If the buildings are properly piped there is no reason in the world why there should be even 1 lb. pressure. The heating is just as perfect with a pound pressure as with 5 or 10 lbs. It is to overcome vertical resistance in the pipes in buildings that requires excess pressure.

The President: It is easy enough for the large roads to make their dividends, but for the smaller roads it is quite necessary that they have every opportunity for selling power, heat and light. On the statute books now there is a law that allows an electric lighting plant to build a railroad, I think, of 20 miles. But the moment a law is proposed whereby an electric railroad may sell light there is bitter opposition to the law. Another mat-

ter in that connection is the sale of power. They all claim, of course, that we have a return grounded current, and the insurance is immediately doubled or trebled, and that prevents us from selling power, although we have on our roads sold a small amount of power. I think it would be very advantageous to the smaller roads if we could sell power. I do not see how we are going to do that until we get a metallic circuit.

Mr. Vreeland: Our friend started out with  $3\frac{1}{2}$  mile proposition paying 6 per cent interest and we all pricked up our ears and we found out before he got through that he is doing a business that would make us double our capital right away. He is making more money out of something else than he is out of his railroad. It is an illustration of the fact that you do not want to criticize a thing until you know the local conditions that surround it.

### TRACK BONDING.

By R. P. Brown and G. E. Chapin, Electrical Engineers, Brooklyn Heights Railroad Company, Brooklyn, N. Y.

The tracks of the Brooklyn Heights Railroad system were originally bonded with the familiar supplementary wire, the section of the rail being such that it was difficult to use any other method. This wire, as well as the branches leading to the rails, was tinned so as to make good contact with the earth, and large copper plates, also tinned, were placed in the damp soil or water in the vicinity of the power house. These plates soon became corroded and coated with insulating substance, and were practically of no value in returning the current, so return feeder wires were run out to make frequent taps to the supplementary wire. As the traffic of the road increased, the cost of this return copper became a serious matter, and when it became necessary to relay the tracks in 1895, the question of bonding received careful consideration. The rails were practically carrying no current, and it was decided that the new construction of 9-in. girder rails would increase considerably the conductivity of the return circuit, provided they were properly bonded.

To take full advantage of the large amount of metal for the track, a bond of high conductivity, the shortest possible length, and low contact resistance, was required. At that time no bond meeting all those conditions could be found, and one was designed by the engineers of the company. As the joints were suspended, there was sufficient space between the ties for applying bonds underneath the base of the rail, and arrangements were accordingly made to make the contacts at that point. The bond decided upon was of cast copper, the full width of the base of the rail, and the connection between bond and rail was obtained by surface contact, about 12 sq. in. of surface being covered by the bond on the end of each rail. This contact came within  $\frac{3}{8}$  in. of the end of the rail, and the connecting metal was left the same size, 5 in. wide and  $\frac{1}{8}$  in. in thickness, the bond being a trifle thicker at the point of contact. The connecting pieces of metal were curved so as to allow for expansion. To secure good connection, a reinforcing plate of cast iron was placed underneath the area of contact and the bond pressed firmly against the rail by two  $\frac{1}{2}$ -in. bolts passing through the base of the rail. No machine work is done on these bonds other than grinding the contact face. The scale was removed from the rail, where bond was to be applied, by grinding with a portable emery wheel. This was not a very costly operation, as the rails were arranged with bases uppermost as they were unloaded from the lighter, and no rehandling was necessary.

To prevent corrosion, a shallow groove was formed around the contact space, and an attempt made to seal the bond water tight by forcing into this groove a non-hardening pitch, heated until very fluid. Owing to the fact that the groove was necessarily very shallow, the bond plate being only 3-16 in. thick, this sealing was unsuccessful in practice; but owing to the large area of contact, if rust had formed in the joint it has in no way affected the conductivity, as recent tests show these bonds to be practically of the same resistance as when first installed, three years ago.

The cost of these bonds was not greater than that of the No. 0000 bond, going completely around the fish plate and having two or three times the electrical resistance of this connection.

The difficulty of attaching a bond underneath the base of the rail, however, was considerable, and careful supervision was necessary to have the work performed in a proper manner. This trouble led to further investigations, with the result that a bond, electrically brazed to the rail, was adopted the following year. This bond was somewhat cheaper than the plate bond, and good work was more easily obtained on account of the better chance of inspection. The use of such a bond had been discussed the two previous years, but was not developed on account of a doubt whether the contact could be made large enough to prevent heating when considerable current was flowing that might give rise to thermo-electric effects between the copper and the iron.

A sample of copper brazed to steel was secured, and after careful tests, it was found that the contact between copper and steel was of negligible resistance as compared with the resistance of the copper strip. Owing to patent difficulties, it was impossible to make any arrangements with the firm supplying this sample, for the use of the bond that year, but a series of experiments demonstrated the possibility of doing the brazing by a process developed by the electricians of the company. There was not sufficient time to obtain special apparatus for doing this work, so the electrical current needed was taken from the railway circuit. To obtain the low voltage required, the brazing apparatus was connected in series with a generator between the circuit breaker and the negative bus of the station. The voltage of this dynamo was raised high enough to overcome the added resistance and the generator run in multiple with the others in the power house. Several brazing contacts were in series, so that the resistance could be kept as uniform as possible, and owing to the very large output of the stations, the variations in the load were slight and very little care was given the regulation of the dynamos used on the welding circuit. Transformers have since been obtained for doing this work, and the brazed bond has been adopted as the standard on all the heavy lines of the system. As no portable brazing apparatus has been obtained, the bond is made in two parts, and brazed on the rail before they are removed from the yard.

The shape of the bond depends on whether it is placed on the web of the rail, so as to come underneath the fish plates, or, as they are now applied, on the base and upper flange of the rail, outside of the joint plate. All forms of the bond, however, are made up of 10 or 12 leaves of 1-64-in. soft copper, the carrying portion of the bond being  $1\frac{3}{4}$  in. wide, and the brazed contact having an area of about one sq. in. Soft spelter, with suitable flux, is used in brazing the copper to the steel rail. The bond is divided longitudinally into three parts, so as to give greater flexibility. When the rails are in position, the ends of these bond leaves are interlaced and fastened together by rivets, and also by solder. The length of the bond between center of contacts is 5 in., and its cross section is equal to 350,000 c. m.

All the brazing of the several thousand bonds now installed has been done with a make-shift device employing processes developed entirely by the electricians of the company. License under the patents of General Payne, of Elmira, and the Thompson Welding Company, have been obtained, to guard against any claim of infringement.

On account of the great number of miles of track that are rapidly being relaid, it was found to be impossible to braze bonds for all the rails with the inadequate means at hand, so the lighter lines have been bonded with the short bonds of the "horse-shoe" type, placed underneath the fish plates. The holes for these bonds are drilled by the makers of the rail, and they are simply reamed out with emery paper to remove the rust that may have formed during shipment. If care is used in compressing the terminals of these bonds, there is no necessity for drilling or reaming of holes on the ground, as any slight irregularities in the drilling fill up when the soft copper is thoroughly upset. The horse-shoe bonds are  $3\frac{1}{4}$  in. in length of No. 0000 cross section, and have  $\frac{3}{4}$  in. diameter terminals.

As a measure of safety, as well as to lower the resistance of the joints, all rails are double bonded whether the brazed or horse-shoe bonds are used.

Curved rails, switches and other special work are often difficult to bond satisfactorily in the yard, and the joint plates are of such section that the bond cannot be placed underneath. In

such work long bonds going around the fish plates are used. On account of the excessive wear on special work, the joints are particularly liable to loosen, so that the bond must be extremely flexible. The No. 0000 bonds are used on this work, and to keep the conductivity the same as the straight rail, both sides of the special work is cross bonded, and the circuit reinforced by running 500,000 c. m. wires joining these cross connections; the number of wires used depending on the current density in the track in each section. The straight track is cross connected every 750 ft. Those cross connections are made of 500,000 c. m. wire fastened to the rail with a terminal for the contact, similar to that of the plate bond mentioned before. These terminals have about 6 sq. in. of contact, and are soldered to the rail. The terminals have a cast iron reinforcement and are bolted to the web of the rail so that no mechanical strain can come on the soldered joint. This same terminal is used to connect the return wires in the track adjacent to the power house to the negative bus.

It has been found that if a single bond is used, it should be placed at the center of the web of the rail if sufficient contact can be obtained at that point. If contact is made at either the base or upper flange, the length of the circuit is increased by the height of the rail, and in case of the 9-in. girder rail the increased resistance is equal to a half of the total resistance of the bond itself. On account of the greater depth of metal, it would seem advisable when two bonds are used, to apply one on the top of the upper flange of the rail and the other on the base. Solid joints are very apt to break if the joint plates become loosened to any extent, and are consequently never used on special work. Contrary to the former practice of tinning the bonds and supplementary wire, the bonds and their exposed copper surfaces are carefully coated with an insulating paint, so that if there is any flow of the current from the track to the surrounding soil, it must leave from the steel and not from the copper. This prevents the bonds being destroyed by electrolytic or other corrosive action.

The Falk cast-welded joints make the best possible electrical connection, and if care is used in the installation, conductivity almost equal to the continuous rail can be obtained. The new electrically welded rail joint, made by the Johnson Electric Company, promises to be equally good.

To guard against imperfect workmanship, a system of testing bonds has been practiced. Usually only the joints on one line of rail are tested, though in sections of high current density, as in the vicinity of power houses, the resistance of each joint is obtained. The test is a simple comparison of the fall of potential across the joint and on a measured portion of an unbonded rail. Two Weston milli-volt meters, with scales ranging from .001 to .3 of a volt, are used, the readings being taken simultaneously. Contact is obtained by pressing hardened steel points on the surface of the rail. These points are set in wooden blocks and placed six inches apart if used on the joints, and 2 ft. part for tests on the solid rail. The distance on the rail is taken for 2 ft. instead of 1 ft. on account of the small amount of current flow in the rail on some of the lighter lines. These testing terminals are provided with handles of convenient length so that the person using them can stand upright and apply the necessary pressure with one foot. Two men can test joints very rapidly with this outfit. The current density of some of the rails was too low to give reliable readings with these instruments, so a portable resistance was arranged on a wagon and the necessary current readily obtained from the trolley wire. This resistance allowed about 300 amperes to flow from the line to the rail, and as it could be very quickly applied, rendered it a comparatively easy matter to test the joints in any section of the city.

Although the bonds are less than 6 in., that length was selected for the distance between terminals of the volt-meter used in testing joints, because it gives a convenient fraction to subtract from the length of each rail in arriving at the total resistance in line of track. The drop on this 6 in. was considered as increasing the length of the rail by an amount proportional to drop in the rail itself. From this the percentage that the rail of any line approached the conductivity of the solid steel rail could be easily determined.



The following results were obtained from different joints:

Joint.	Drop, Volts		Conductivity, Per Cent.	
	1 ft. of Rail.	1ft. with Joint.	30-ft. Rail.	60-ft. Rail.
Falk .....	.00215	.00355	98.	99.
Double brazed bond.	.00725	.00758	99.8	99.9
Johnson bond (2 ft.).	.00364	(6 in.)00342	95.6	97.8
Plate bond (2 ft.)...	.0109	(6 in.)0233	89.	94.

It will be seen by the foregoing that it is a comparatively easy matter to get a conductivity of over 90 per cent of a continuous steel rail. As high as 600 amperes can be safely carried on any of the bonds mentioned, and the cost of double bonding in a satisfactory manner should not exceed 75 cents per joint. The conductivity of steel varies with the amount of carbon in its composition, but, generally speaking, it is about one-eighth of the conductivity of commercial copper. Bearing these facts in mind, it will be readily seen that it is much cheaper to make the return circuit wholly of well bonded steel rails, supplementing the track in the vicinity of the power house with worn out rails carefully bonded.

Mr. Powers: I would like to ask if there is any particular reason for abandoning the tinning of the bonds.

R. P. Brown: Yes, sir. When the bond is tinned it gives a very much better contact with the earth than the steel does. If there is any tendency for the current to leave the track it goes to the bond. If the bond is insulated it must go from the steel, so very little corrosion takes place.

## RAILS; THEIR CONSTRUCTION FROM A SCIENTIFIC STANDPOINT.

By A. J. Moxham, President of the Lorain Steel Company.

The company in which the writer is interested has, from its inception, been studying the above question. Volumes have been written dealing with the different theories of different authorities, and their information is at the disposal of all. That it does not lead to a safe conclusion is proved by the fact that the question is today still an open one; in other words, authorities do not agree.

Many years ago the London & Northwestern Railway Company, of England, reached the conclusion that what was known as a "soft" or low carbon rail gave the longest life, and its conclusions were honestly based upon what appeared to be clear-cut, practical experience. This was reinforced shortly afterwards by Professor Dudley, at that time acting for the Pennsylvania Railroad Company, who gave the result of tests that on the face of them were to be relied upon. His paper was an able contribution to the knowledge of the day. His general conclusions led to the "soft" rail, and he went further and endeavored to determine by comparison a factor for each special chemical ingredient. His conclusions created something akin to a sensation, and they were bitterly opposed by the steel experts of the time.

Perhaps the fact that the steel manufacturer of that day was not sufficiently master of the situation to economically produce the ideal rail, according to Dr. Dudley's standard, may account for a good deal of the opposition. During the same period, however, notwithstanding these deductions, the tendency of the rail called for in actual practice was always to higher carbon. The writer himself, during this interval, was a supporter of the "soft" or ductile steel for rails; and even to this day, and in view of what is to follow, it is to the writer's mind a questionable thing whether a steel of great ductility and only of moderate hardness is not the steel for steam railroad purposes. It must be remembered, however, that the problem of wear upon a steam railroad is a very different thing from that of wear upon a street railway. The rail in steam railroad use presents a clean head, because the rail is not buried. It has to oppose principally a rolling friction, for the number of times per mile that steam railroad trains are stopped is very few, taking a general average. The street rail, on the other hand, has not only to meet this rolling friction, but has to contend with the grit from the surrounding roadbed and with stops every few feet. Not only are

the stops incomparably more frequent, but they are again multiplied into a greater number of units, as many individual cars are the rule on street railways as against the occasional train of the steam road.

Being unable to reach positive conclusions from the published authorities and from personal contact with the steel experts of the country, or even from our own experience, it was determined to conduct experiments to this end.

It was accepted, to begin with, that it would be folly to try to finesse in the matter; that the best that could be done would be to try to find general, safe indications. When it is remembered that each chemical ingredient puts its own particular stamp upon the steel and a different stamp in each particular combination with the other ingredients, and that the number of such combinations may be infinite; when it is remembered that each different heat at which the steel is rolled affects the problem; that the amount of draft put upon each successive pass should not be ignored, the necessity of the conclusion becomes evident. Hence the present effort is not to pass upon the proportion of each particular thing, be it good or bad; it is not a search for the perfect steel; but only a prayer that light may be shown in the right directions.

The experiments have lasted for three years. The first endeavor was to take broadly a "soft" steel and a "hard" steel for the rails to be tested, securing the difference by carbon alone, leaving all other ingredients as nearly as possible the same. The experiment with these started in October, 1895, and has been continuous ever since. In June, 1896, additional rails were added to the experiment, supplied by the West End Street Railway Company, of Boston, who at that time had determined (with wisdom, as will be seen subsequently) upon a steel both hard and ductile. The conclusions, therefore, are based upon what may be described as soft steel, hard steel, and steel both hard and ductile.

The rails (some 33 in all) were laid in the South Eighth street tracks of the Nassau Electric Railroad, of Brooklyn. They were laid continuously, so that the same car is obliged to pass over every rail, and therefore each rail is subject to the same wear, and the wear on the head only is considered. Street traffic is ignored. The point was selected as one that would give great wear in a short time, in order to reach early conclusions, as the cars pass this point at extremely short intervals.

Every rail has been measured at two points, taken about 10 ft. from each end, in order to eliminate the special wear at the joints. Each rail has two cast iron boxes bolted to the outside, at the points to be measured, to permit access for purposes of measurement without disturbing the roadbed. Originally the wear was registered both by actual measurement and by taking an impression of the rail by means of type-metal castings. Two slots were provided in the tram of the rail to guide the type-metal mould. Notwithstanding the great care that was exercised in taking the impressions, this method of measurement was quickly given up, as the results were far from being as accurate as those taken by micrometer calipers. With these calipers, measurements of each rail are taken at three points across the head of the rail.

- No. 1 being at a point near the gage line;
- No. 2 being nearly in the center of the head, and
- No. 3 being nearer the outside of the head.

Speaking accurately,

- No. 1 is 2 in.;
- No. 2 is 1 3/4 in., and
- No. 3 is 3/4 in.,

all from the outside of a head 2 1/4 in. wide. Methods were adopted for accurately locating the same lines, so that the comparisons in the different measurements of wear are to be relied upon.

In Table 1 are the exact figures of the results: 17 rails of low carbon (viz.: averaging .28), are designated as "soft" rails; 14 rails containing high carbon (viz.: .59), are designated as "hard" rails. It will be noted, in comparing these two classes, that the other ingredients, from a metallurgical standpoint, are comparatively similar; indeed, an effort was made in their manufacture to make them exactly the same, and while this is an impossibility, the results are remarkably close. Any difference,

therefore, between these two classes, as far as chemical differences are concerned, can be safely laid to the carbon. The third class consists of the rails furnished by the West End Street Railway Company.

It will be noted that the table embodies perhaps every item that is known to the metallurgist of today as affecting the problem, viz., chemical composition, specific gravity and physical tests, both in tension and compression. The least wear shown is in the West End rail, the hard rail follows, a good second, while the greatest wear is shown in the soft rail.

Table II shows the average monthly wear, which for purposes of comparison is best taken, the results being .0007 for the West End rail per month, .0012 for the hard rail, .0017 for the soft rail. The result of the experiments are conclusive on this point. We will, therefore, in the subsequent analysis, start with this as a fact. We will refer first to the physical test, and take last the question of chemical compositions. In the physical tests we will take first:

A, Specific Gravity. (See Table III). It will be noted that the West End rails show a specific gravity of 7.825, the hard rails 7.841, and the soft rail of 7.855. But in considering specific gravity it had best be based upon the iron alone in the composition. It is well known that the other chemical ingredients affect the net result almost imperceptibly in the matter of weight, but very greatly affect the density of the iron (which is the bulk of the composition) in the matter of its physical property. It will be found a law that where specific gravity is referred arbitrarily to the iron and the metalloids are ignored, or rather deducted, the specific gravity will tally closely with what is to be expected from the actual use of the metal, for instance, in this case, ignoring the metalloids, the specific gravity of the iron in the different rails will stand as follows:

Soft rail.....	.7956,
Hard rail.....	.7971;
West End rail.....	.7977.

and it is interesting to note the very close relations of this arbitrary specific gravity to the relative wear as shown in the test. This is not a point to be ignored, because it is an exponent of the mechanical treatment, and it explains consistently in this, as in many other cases, why the material with apparently (but not really) the lightest specific gravity, will show the best results in use. The analysis shows that what is needed, as may be expected, is the densest steel.

Taking now, B Tension and Compression Tests.

It will be noted that in the tension tests the ultimate strength stands as follows:

Soft rail.....	75,860 lbs.;
Hard rail.....	118,160 lbs.;
West End rail.....	120,380 lbs.;

closely following the determined wear. In elastic limit the relation is:

Soft rail.....	45,730 lbs.;
Hard rail.....	62,500 lbs.;
West End rail.....	53,160 lbs.

This, it will be noted, does not follow the rule of wear; and in this is a lesson, the indication being that having secured a given amount of hardness, and consequently of strength, that the more brittle the rail the better the wear. In the compression tests the same lesson is learned. The elastic limit of compression standing at:

Soft rail.....	35,000 lbs.;
Hard rail.....	50,300 lbs.;
West End rail.....	47,100 lbs.

At first glance it would appear that the rail compressed the least would wear the longest, but where difference in compression is indicative of greater elasticity without a sacrifice of ultimate strength, it is within reason to the good.

We will deal now with chemical composition; comparing first the soft and hard rails. As stated before, the only variation in chemical composition which we need look at in this comparison is the carbon, for while there is a slight variation between the two silicons in the given rails the total percentage of a silicon in either is not a factor and can therefore be ignored. The greater durability of the hard rail, as compared with the soft rail,

speaks for the higher carbon; and it may here be noted, that so far as the higher carbon is concerned, it involves no higher cost to the street railway man.

On comparison, the carbon of the West End rail is practically the same as that of the hard rail, silicon considerably higher, but the real point of difference between the hard rail and the West End rail lies in the lower phosphorous and higher manganese. It is well known that the low phosphorous, accompanied by an increasing manganese, conduces to greater ductility. On this point, however, a word of caution is necessary. Any decrease of phosphorous from what is known as standard in Bessemer steel, viz., .10, can only be achieved at a greatly increased cost of manufacture; and, therefore, so far as the chemical constituents of the rail are concerned, the whole problem to the street railway man is, how far is it economical to go in lower phosphorous, the other hardening elements remaining the same. A steel such as represented by the West End rail, or even a steel still lower in phosphorous, it is possible to make; it is surely a question of cost. On today's basis, an extra cost of \$1.50 per ton on the low phosphorous steel is a low estimate; it would be safer to take it at \$2.00. Taking the average price of girder rails at, we will say, \$25.00, the extra cost of the low phosphorous would be 8 per cent. What would be the increased wear of the rails?

The average monthly wear of the hard rail is..... .0012, and the average monthly wear of the West End rail is.... .0007. On the face of it it would appear, therefore, that those who could afford it were amply justified in demanding and purchasing the low phosphorous steel, but there is a hope for those who cannot afford it; and there is some doubt, after all, as to the advantages to be gained from so doing, which, to my mind, brings us to the real lesson of the whole experiment. Pay close attention to what follows:

We all know that we can use a street rail until at least  $\frac{1}{2}$  in. has worn away from the head, or .5. On this basis and taking the average wear of the different rails as shown in the test it would take

25 years to wear $\frac{1}{2}$ in. with the soft rail;
35 years to wear $\frac{1}{2}$ in. with the hard rail;
60 years to wear $\frac{1}{2}$ in. with the West End rail;

and this in the case of a road which represents not average, but successive wear; the rails in question having borne the wear of heavily loaded cars running on an average of 580 per day for 20 hours per day, during the time of the experiments, or a two-minute headway. This meaning during the busy part of the day less than  $\frac{1}{2}$ -minute headway, and during the night hours a wider interval. Taking the ordinary line, its average headway is less than this, consequently the theoretical wear would be greater. Now all of us who are interested in electric roads and have used girder rails, are aware of the fact that we do not get anything like this wear, and this being the case, we have got to look to something else besides quality of steel. I think we all know what the cause is, and I am glad to again emphasize it because it discloses a great evil we are still suffering from without realizing it to the extent we should; the defect is in the joints.

Had these measurements of wear been taken at the joints instead of elsewhere the lesson would have been different. Rails are taken out of the track today not because the rail as a whole has reached the point of destruction, but because the joints have become too bad for further use. It must be remembered that the experiments in question have not been extended long enough to show the effects upon the rail of the degeneration of the joints. On the wear at the joints reaching a certain point the wear of the rail increases rapidly. For instance, in the soft rail the average monthly wear being .0017 during the time of this experiment; in seven or eight years from this date the wear will have continued to go on at a constantly increasing ratio, starting from the point of defect at the joint.

In the early days of girder rails the joint question was before us all. It was self-evident, in that the earlier construction was so light that the joints quickly went to pieces. During later years, using a heavier rail and larger and better fitting splice bars, we have heard less of this joint question, for as compared



TABLE I.

RAIL No	HEIGHT OCTOBER 1895						HEIGHT AUGUST 1898						WEAR OCT. 95 TO AUG 1898						GRAVITY AT 60° F	CHEMICAL COMPOSITION						TENSION TEST			COMPRESSION TEST				
	WEST			EAST			WEST			EAST			WEST			EAST				GRAVITY	C	P	S	Mn	Elastic Limit, lbs per sq in	Elongation, %	Reduction of Area, %	Elastic Modulus, lbs per sq in	Elastic Limit, lbs per sq in	Elongation, %	Reduction of Area, %		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3															
1	7 316	7 336	7 341	7 336	7 353	7 348	7 278	7 278	7 285	7 255	7 261	7 290	0 85	0 86	0 86	0 83	0 82	0 82	7 854	0 62	0 51	0 53	0 95	0 53	79	7 854	41 470	77 020	25 8	53 6	33 400	30 700 000	1
2	7 326	7 336	7 340	7 330	7 346	7 348	7 265	7 265	7 275	7 245	7 245	7 275	0 80	0 67	0 60	0 85	0 59	0 62	7 856	0 69	0 13	0 32	0 90	0 51	76	7 856	42 120	71 220	26 3	53 5	30 000	22 600 000	2
3	7 320	7 324	7 332	7 330	7 332	7 335	7 265	7 275	7 275	7 260	7 260	7 286	0 75	0 59	0 47	0 60	0 52	0 49	7 855	0 57	0 08	0 26	0 94	0 56	76	7 855	42 830	72 120	25 9	52 2	26 000	28 400 000	3
4	7 318	7 330	7 334	7 333	7 335	7 335	7 262	7 274	7 274	7 260	7 260	7 299	0 76	0 56	0 50	0 61	0 57	0 52	7 854	0 57	0 26	0 31	1 02	0 61	80	7 854	45 990	74 230	25 6	53 2	38 100	32 300 000	4
5	7 312	7 320	7 320	7 314	7 329	7 336	7 268	7 268	7 265	7 249	7 249	7 275	0 64	0 60	0 61	0 77	0 65	0 72	7 855	0 45	0 19	0 28	0 98	0 62	79	7 855	45 360	73 170	23 9	53 2	38 300	31 000 000	6
6	7 319	7 323	7 324	7 312	7 325	7 325	7 263	7 263	7 263	7 235	7 260	7 275	0 69	0 56	0 44	0 66	0 51	0 38	7 854	0 54	0 25	0 32	0 97	0 62	80	7 854	44 460	77 960	24 6	53 6	30 600	29 000 000	7
7	7 317	7 326	7 324	7 315	7 324	7 328	7 272	7 272	7 272	7 260	7 249	7 275	0 69	0 56	0 44	0 66	0 51	0 38	7 854	0 54	0 25	0 32	0 97	0 62	80	7 854	44 460	77 960	24 6	53 6	30 600	29 000 000	8
8	7 316	7 326	7 324	7 315	7 324	7 328	7 272	7 272	7 272	7 260	7 249	7 275	0 69	0 56	0 44	0 66	0 51	0 38	7 854	0 54	0 25	0 32	0 97	0 62	80	7 854	44 460	77 960	24 6	53 6	30 600	29 000 000	9
9	7 323	7 336	7 341	7 330	7 337	7 337	7 265	7 294	7 310	7 266	7 267	7 286	0 58	0 47	0 31	0 54	0 50	0 39	7 856	0 46	0 27	0 26	1 07	0 69	80	7 856	45 970	75 490	24 6	51 7	36 000	30 300 000	10
10	7 330	7 336	7 341	7 330	7 337	7 337	7 265	7 294	7 310	7 266	7 267	7 286	0 58	0 47	0 31	0 54	0 50	0 39	7 856	0 46	0 27	0 26	1 07	0 69	80	7 856	45 970	75 490	24 6	51 7	36 000	30 300 000	11
11	7 317	7 331	7 334	7 323	7 335	7 335	7 265	7 281	7 299	7 255	7 263	7 300	0 64	0 50	0 35	0 68	0 52	0 28	7 859	0 50	0 18	0 05	1 45	0 96	85	7 859	48 500	82 810	22 5	49 4	38 400	31 200 000	11
21	8 945	8 928	8 944	8 936	8 941	8 952	8 875	8 860	8 863	8 878	8 874	8 885	0 70	0 68	0 61	0 58	0 67	0 69	7 854	0 69	0 34	0 32	1 04	0 70	78	7 854	46 870	75 550	25 8	53 0	33 200	37 200 000	21
22	8 945	8 934	8 949	8 940	8 955	8 955	8 884	8 863	8 874	8 910	8 875	8 891	0 69	0 71	0 65	0 70	0 80	0 59	7 854	0 69	0 34	0 32	1 04	0 66	77	7 854	47 420	76 890	26 1	52 2	35 700	30 000 000	22
23	8 954	8 937	8 954	8 930	8 937	8 939	8 900	8 885	8 894	8 868	8 870	8 876	0 54	0 52	0 54	0 62	0 62	0 51	7 855	0 58	0 27	0 10	1 04	0 70	78	7 855	44 780	74 590	20 6	52 6	31 600	31 000 000	23
24	8 935	8 935	8 935	8 935	8 933	8 935	8 875	8 883	8 893	8 883	8 885	8 896	0 60	0 42	0 42	0 42	0 42	0 42	7 855	0 47	0 31	0 04	1 14	0 70	80	7 855	47 250	78 820	23 5	50 5	33 400	26 700 000	24
25	8 948	8 934	8 932	8 946	8 959	8 942	8 888	8 882	8 885	8 875	8 878	8 878	0 60	0 45	0 50	0 61	0 84	0 64	7 855	0 47	0 31	0 04	1 14	0 70	80	7 855	47 250	78 820	23 5	50 5	33 400	26 700 000	25
26	8 935	8 925	8 931	8 936	8 936	8 937	8 892	8 870	8 875	8 903	8 870	8 881	0 41	0 35	0 36	0 35	0 66	0 51	7 854	0 51	0 31	0 27	1 16	0 71	83	7 854	48 720	80 590	24 0	48 5	35 700	30 000 000	26
										Average			0 65	0 57	0 51	0 63	0 62	0 51	7 855	0 58	0 26	0 10	1 06	0 66	79	7 855	45 730	75 860	24 3	51 6	35 000	30 000 000	Average
12	7 306	7 325	7 322	7 310	7 332	7 336	7 258	7 277	7 283	7 265	7 266	7 300	0 48	0 48	0 48	0 48	0 48	0 48	7 842	0 44	0 10	0 04	0 90	0 52	81	7 842	57 840	110 270	15 4	26 5	48 700	37 300 000	12
13	7 307	7 340	7 327	7 315	7 339	7 345	7 264	7 281	7 284	7 269	7 274	7 287	0 43	0 63	0 43	0 46	0 55	0 48	7 845	0 50	0 10	0 05	0 97	0 55	84	7 845	59 220	115 750	13 3	22 1	46 400	31 400 000	13
14	7 306	7 322	7 319	7 312	7 324	7 321	7 273	7 273	7 266	7 256	7 275	7 285	0 43	0 49	0 43	0 54	0 49	0 36	7 839	0 44	0 15	0 06	1 04	0 66	83	7 839	64 240	100 720	13 3	21 3	51 400	31 400 000	14
15	7 316	7 334	7 328	7 326	7 332	7 332	7 269	7 293	7 307	7 269	7 292	7 305	0 45	0 41	0 31	0 57	0 40	0 25	7 842	0 36	0 19	0 01	0 93	0 55	82	7 842	57 790	109 360	15 1	29 5	45 800	31 000 000	15
16	7 300	7 315	7 312	7 312	7 308	7 322	7 260	7 260	7 268	7 254	7 277	7 290	0 40	0 35	0 24	0 54	0 45	0 31	7 840	0 61	0 12	0 02	1 06	0 65	85	7 840	62 700	120 100	13 3	19 3	51 500	31 400 000	16
17	7 323	7 333	7 346	7 336	7 340	7 342	7 266	7 292	7 304	7 257	7 285	7 302	0 66	0 61	0 42	1 01	0 57	0 40	7 842	0 61	0 12	0 03	0 94	0 61	85	7 842	57 750	109 390	13 4	29 2	49 000	30 300 000	17
18	7 317	7 331	7 320	7 317	7 327	7 326	7 275	7 282	7 282	7 272	7 272	7 288	0 50	0 49	0 56	0 48	0 45	0 39	7 841	0 41	0 11	0 03	1 01	0 62	83	7 841	61 690	116 800	13 4	21 7	53 700	31 100 000	18
19	7 300	7 318	7 317	7 317	7 327	7 312	7 283	7 282	7 293	7 256	7 277	7 296	0 47	0 46	0 24	0 41	0 35	0 15	7 840	0 18	0 33	0 10	1 04	0 65	84	7 840	66 670	127 510	10 0	9 8	54 100	32 500 000	19
20	7 305	7 321	7 321	7 310	7 322	7 318	7 280	7 284	7 308	7 269	7 286	7 297	0 55	0 37	0 14	0 32	0 46	0 21	7 848	0 54	0 10	0 04	1 04	0 67	85	7 848	60 470	110 350	6 9	7 4	36 700	30 300 000	20
27	8 945	8 934	8 936	8 923	8 911	8 910	8 860	8 875	8 886	8 876	8 860	8 880	0 65	0 49	0 46	0 42	0 43	0 36	7 848	0 54	0 10	0 04	1 04	0 67	85	7 848	63 730	120 600	13 4	23 5	54 000	33 600 000	28
28	8 935	8 920	8 931	8 935	8 914	8 912	8 895	8 892	8 893	8 892	8 884	8 885	0 30	0 26	0 38	0 43	0 31	0 37	7 846	0 33	0 18	0 03	1 04	0 66	86	7 846	63 730	120 600	13 4	23 5	54 000	33 600 000	28
29	8 907	8 923	8 945	8 922	8 903	8 912	8 877	8 875	8 878	8 886	8 874	8 883	0 70	0 48	0 67	0 36	0 35	0 32	7 846	0 33	0 18	0 03	1 04	0 66	86	7 846	66 910	125 410	12 0	14 9	54 100	33 700 000	29
30	8 939	8 934	8 935	8 945	8 929	8 943	8 885	8 881	8 876	8 917	8 894	8 893	0 54	0 53	0 49	0 28	0 39	0 50	7 846	0 33	0 18	0 03	1 04	0 66	86	7 846	66 000	121 220	5 9	3 5	31 200	31 200 000	30
31	8 929	8 914	8 921	8 936	8 900	8 951	8 915	8 886	8 880	8 910	8 887	8 889	0 14	0 16	0 21	0 16	0 05	0 12	7 841	0 33	0 18	0 03	1 04	0 66	86	7 841	66 970	122 860	12 5	19 7	54 000	31 300 000	31
										Average			0 59	0 45	0 37	0 47	0 47	0 35	7 841	0 43	0 19	0 04	1 04	0 67	83	7 841	62 500	118 100	11 9	18 4	50 300	32 300 000	Average
										Average			0 68	0 68	0 68	0 68	0 68	0 68	7 841	0 43	0 19	0 04	1 04	0 67	83	7 841	62 500	118 100	11 9	18 4	50 300	32 300 000	Average
32	8 936	8 908	8 888	8 937	8 900	8 882																											





with the earlier joints the track is comparatively smooth. Nevertheless, the evil still exists, and a few years from now those who today are deluding themselves in the belief that they have a long life for their existing tracks will awake to find out that even the construction of today is wasteful and extravagant in this respect. The joint which is accepted now as being passably fair is reducing the life of the rail to one-half or perhaps even one-third of what it should be.

The conclusions we are led to seem to me to be as follows:

1. That for street railway use a "hard" rail will give the best results.

2. That the most economical way to secure this hardness is by increase of carbon, accepting the manufacturers' standard specifications for the other ingredients.

3. That the next step should be towards an improvement of the joints.

As is well known to all present, the writer has pinned his faith to the electric welded joint as settling the question once for all, by making the union homogeneous with the rail and possessing an advantage from an electrical standpoint in the matter of conductivity. Nevertheless, the cast-welded method also demands careful consideration. It is certainly preferable to anything in the nature of splice bars that we know of, provided one glaring fault can be overcome, viz., the softening of the steel that occurs from the large body of hot cast metal located at that point, and it would appear that some means could be devised to overcome this evil.

4. After making the joints perfect, what we have termed the "West End rail" would certainly justify its extra cost. As the analysis of each rail is embodied in this paper I need not here refer to it.

It is unnecessary to give the analysis applicable to each of these classes, as the table gives it in full detail. I would caution, however, against the use of carbon as high as .59, as that was purposely taken high in what we term the "hard" rail in this experiment, the object being to reach an extreme. Carbon should be limited to from .50 to .55, with the usual leeway to cover manufacturing contingencies. It also remains a question whether the reduction of phosphorous to .08 (which may be done within economical limits of cost) will not give results so closely approximating .05 of the West End rail as to make that figure an economical one. Whether or no the certainty exists that so far as the steel is concerned, a rail of the following analysis should give a theoretical wear, if the joint is perfected, of from 40 to 50 years, viz.:

Carbon.....	.55
Silicon.....	.10 or under
Phosphorous.....	.08 or under
Sulphur.....	.06 or under
Manganese.....	.83 or over, not to exceed 1.00

The great lesson I would once more emphasize is that until you get the joints perfect you need not worry about the quality of your steel; anything in the shape of steel—the very cheapest you can buy—will last longer than the joints will permit you to keep your rails in the track.

TABLE 11.

AVERAGE MONTHLY WEAR OF TEST RAILS.

1 .....	.0018
2 .....	.0020
3 .....	.0016
4 .....	.0015
5 .....	.0016
6 .....	.0019
7 .....	.0015
8 .....	.0020
9 .....	.0013
10 .....	.0015
11 .....	.0014
21 .....	.0020
22 .....	.0020
23 .....	.0017
24 .....	.0013

25 .....	.0017
26 .....	.0015
<hr/>	
Average monthly wear, soft rails.....	.0017
12 .....	.0012
13 .....	.0014
14 .....	.0012
15 .....	.0011
16 .....	.0011
17 .....	.0017
18 .....	.0012
19 .....	.0009
20 .....	.0009
27 .....	.0013
28 .....	.0010
29 .....	.0014
30 .....	.0013
31 .....	.0009

Average monthly wear, hard rails..... .0012

The foregoing are from observations for the 34 months from October, 1895, to August, 1898.

32 .....	.0008
33 .....	.0005

Average monthly wear, West End rails..... .0007

From observations for 26 months from June, 1896, to August 1898.

TABLE III.

	Soft.	Hard.	West End.
Carbon .....	.280	.59	.570
Silicon .....	.026	.056	.234
Phosphorous .....	.106	.097	.050
Sulphur .....	.066	.059	.078
Manganese .....	.790	.83	.980
<hr/>			
Iron .....	1.268	1.632	1.912
	98.732	98.368	98.088
<hr/>			
	100.	100.	100.
Spec. Gr.....	7.855	7.841	7.825
Based on iron only (ignoring the metalloids) .....	7.956	7.971	7.977

## TRACK CONSTRUCTION.

By D. F. Carver, Track Department, Brooklyn Heights Railroad Company.

In the development of street surface railways, from their operation by animal power to their operation by cable or electric power, the experiences of those concerned have been many and varied. Although some of the experiences gained may have been through unpleasantness, it is of great credit to those engaged that they have succeeded in developing, in so short a time, such an enormous industry from so small a beginning.

The greater service and durability exacted of the track work and roadway, the first exaction due to the heavier loads on wheels, the increased machinery and the comfort of the passengers, the other exaction caused by many local officials for the comfort and safety of vehicles, have made it imperative that the general construction of track work should be reduced to a science.

It is at the present time more essential to give an expression of opinion as to those appliances in sight which give the best results, and not to refer to those which have been found wanting and have been abandoned.

The essential feature of good track construction and good pavement is a good foundation. In a majority of cases this exists naturally at the depth at which ties are laid. If the natural foundation is not suitable, it can be made so by the use of broken stone or gravel.

The ties should be of the best quality of yellow pine ties, sawed four sides, and of a size sufficient to give a bearing on foundation of not less than  $4\frac{1}{2}$  sq. ft. per tie. A very excellent and economical spacing has been found to be 24 ties to a 60 ft. rail.

All ties should be thoroughly tamped near the rail, and the joint-ties tamped throughout their lengths. The dirt under the base of the rail should be thoroughly tamped, otherwise there will be a settlement which will allow the rail stones to be forced down.

The rail used should be of hard steel, and of a section that will give it great stiffness. The tread should be either level, or, as is becoming common practice, should bevel, so that the wheels will have a bearing for the width of the tread. This latter arrangement gives greater contact for traction and stoppages, and also causes less damage to wheels that are skidded in an emergency stop.

The web of the rail should be, as nearly as possible, beneath the center of the tread, so that the resultant of the forces of weight and lateral motion of the wheel shall fall within the width of the base.

As the lightest section of 9-in. rail is more than amply strong to stand the stress of carriage, provided, of course, that every tie has a first class bearing, it has been found desirable to roll the web down to the thinnest section possible, and accept the small losses due to rails splitting along the web from the tension caused by the very unequal distribution of metal. The breakage above referred to has been found to be, throughout a year's work, about  $\frac{1}{4}$  of 1 per cent of rail laid.

The problem of the rail joint has been a very trying one, but it is fast approaching a successful and satisfactory solution, the essential features of which are either a welded joint, which makes a rail practically one continuous mass, or the mechanical joint, which avails of the bearing surfaces beneath the head and tram, and beneath the base, and of the upper surface of the base of the rails which it connects. Either joint, to be entirely successful, however, must be laid with tight joints, so that passing wheels will have a continuous bearing.

This method of construction will, in time, force the track out of line, and where the line is curved to any extent, will push the curve out of line; and also in renewing any portion of the track in warm weather, it will be found almost invariably impossible to put in new pieces of the same size as the old removed, because the great compression strain closes up the opening. Still, with all these objections, the added length of life of joints gained, is of decided advantage.

With the girder rail sections, in block paved streets, it is absolutely necessary to use a rail filler. We have experimented with the burnt brick, which was found to crumble badly under heavy wagon traffic, and it has been abandoned. In its place is used hemlock planks, which give the best results on the investment.

In paving up the street, the portions outside the outside rail and between the tracks should be paved and thoroughly rammed before the sections between the rails are paved. This prevents the crowding of the stones between rails, from forcing the track out of gage.

A bed of concrete between ties has been tried, to prevent the paving blocks from sinking, but such experience as the writer has had with this construction has not been very satisfactory, and as its first cost is great, and also as the interest on this extra investment is, in many cases, greatly in excess of the maintenance charges which it is intended to prevent, he is led to very greatly doubt its utility.

Mr. Littell: In 1897 we put in about five miles of track without any ties. We dug the trench 20 ins. wide and 17 ins. deep, and then we suspended our rail. We had an appliance made so that we could line it perfectly and surface it perfectly, with small screws, and then we mixed the concrete and tamped under it so that the concrete came just above the base of the rail. After leaving it in that position for 24 hours we took away our clamps and then filled on the sides of it with concrete. We laid the joints staggered, and used a 60-lb. rail, and within a week I walked over a part of it. I saw no movement of any

kind, no perceptible change of any kind. I went over it immediately after a rain and I watched cars that passed it, and you could not see a bubble or the least movement of the rail. It was perfectly solid. We used Portland cement and very fine broken stone. There has been 17 miles of railroad built in Buffalo where they put down the concrete base first and then put the rail on top of it, and then filled up the space with Portland cement and fine sand. But there are a very few places in that concrete base where you can see a little movement once in a great while. So that I think that the process of tamping the concrete under the rail is very much better than first laying the concrete base. We use in this 12-bolt spliced bar a rail weighing 94 lbs. to the yard. If I were laying a new track I would always use a concrete base. Where you are using a track that you have to run over it within a very short time it is very difficult to do it. This spring we had to reconstruct some track and we put in in that case a tie every 10 ft. simply to hold the alignment. We surfaced the ties on the ends on sand or gravel first and then tamped under the ties with concrete; we then removed the gravel from the ends and tamped there with concrete so as to get perfect surface and alignment and then tamped with that concrete base under the rail. We were able to use the track five to six days after it was laid, and it is very difficult to find the joints. You have got to look for them. They were laid just as tight as we could lay them, and it is what I call a perfect tie.

The President: Do you hold your gage by tie-rods?

Mr. Littell: Not in this case. We used the same process of filling the space between the head and the base with concrete. We set our tothing in cement, and asphalt on the outside. We have 50 miles of track laid, I am sorry to say, with the asphalt carried right up to the back of the rail. Asphalt next to the rail is a very serious problem in a street railroad. Where the street is used a great deal, where vehicles will keep it ironed out, as it were, it will stand fairly well if the track is solid. But where the street is not traveled on very much the concrete disintegrates and water gets in. The concrete base reduces the cost of laying the track and the cost of repairs enormously.

The President: Before we pass to the next paper, I want to ask another question for the information of all present: How many are using storage batteries, and with what success? I know that they use it in Buffalo.

Mr. Littell: I cannot say very much about the storage battery excepting that we have one in use. It has been in use about nine months. It might be called an accumulator. It is an auxiliary of our power house. As many of you are aware, we get a certain amount of our power from Niagara Falls—2,000 h. p., and we have nominally 7,000 h. p. in the steam plant. This storage battery was put in partly as an experiment. I had great difficulty in convincing my directors that it was a good thing. When we put it in we made a contract for 1,200 h. p. hours. But in making my contract I provided that the cells should be large enough so that I could increase the battery two-thirds. I think we shall soon increase it, as we are very much pleased with it. It takes all the sudden calls upon us for energy, and there have been times when we have but one engine in use, a 1,200-h. p. engine and 2,000 h. p. up in the Falls, and the Falls power for some reason stopped on us, but the cars went on. The people didn't know it. It held us for 15 or 20 minutes until we could get in more engines. We have had cases at night where we shut down the power from the Falls and ran three or four hours with the battery. We have tested it in every possible way, and I am a firm believer in it. I think it is a good thing for a steam plant, as well as for a plant like ours. I am not interested in a storage battery or any accumulator. Simply, I am a believer in it.

Mr. Vreeland: As a result of considerable experience with storage accumulators as an auxiliary to power plants in Philadelphia and in Pittsburg, we have just contracted for one of the largest storage battery that has ever been erected for a street railway company, as an auxiliary in our work the coming winter. Our station is a little peculiar. We are building a very large power station, 70,000 h. p., and it will not be ready until next spring. We have not sufficient power to carry us



over the winter by direct current from the generators, and we determined upon a storage auxiliary to this large plant when completed, and are erecting the fields for it. We determined that we could, by installing a portion of the plant at the present time and getting sufficient storage capacity to take the peak of our load for heating and lighting during the winter months, manage until we get our large house completed, when we shall probably put in batteries of three or four times the present capacity. The experience of the engineers in charge, with whom I have communicated, both in electric lighting and electric street railroading, is that the storage battery is an economical auxiliary to any plant which has reached the limit of the power capacity in very heavy hours. The plant in Philadelphia was placed where there were some extensions made at a point where the house that fed that section of the city had reached the limit of its capacity and it was either necessary to build another house or add some storage capacity in that section of the city, which was the original cause for the installation there. The storage battery question as an auxiliary to that extent is very satisfac-

Mr. Littell: I think that any road running 30 to 50 cars can afford a storage battery and would be justified in putting one in. The original cost is quite expensive, but I think we will get our cost back the first year.

#### THE USE OF THE INDIVIDUAL FARE BOX.

By T. J. Nicholl, General Manager Rochester Railway Company.

When I wrote the president of this Association that it would give me pleasure to present a brief paper on "The Use of the Individual Fare Box," I thought that beyond question their adoption on the railroad of the company I have the honor to represent would solve, to a great extent, the much vexed question of how best to collect its revenue. I take it for granted that the Rochester Railway Company is only one of a great many other street railway companies that find the question of collecting their whole revenue by far the weakest and at the same time the most important part of their management, and that



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torily determined by the tests in electric lighting stations and for some time with street railroads. One of the most eminent electrical engineers in this country, who has large experience with the storage battery and spent some years in a company that was attempting to perfect and operate a storage battery, whom I sent for a year or two ago to talk over the question in conjunction with the Chicago system, which was to use an accumulator car, said that after years of experimental work in conjunction with storage batteries, he had come to the conclusion that as storage batteries got their power from destruction—the eating up of the plates—and as that could be accelerated by motion, that the economical place for a storage battery was in a large safe with the combination lost and the wires carried out, and then you would get a commercial storage battery. (Laughter).

The President: Mr. Vreeland and Mr. Littell, may I ask a question? Are those storage batteries economical for smaller roads in provincial cities, say 25 or 30 cars, or 50 cars, where the plant has reached its maximum. Is it economical, or are they too expensive for us to put them in?

any practical solution of the problem would be hailed with great joy in all parts of the country.

Now, gentlemen, for many months before I made the attempt to introduce the fare box on the Rochester Railway, I had watched with great interest the methods in use in Canada, England, and some cities of the United States, where various fare boxes are used, and after careful investigation, not only of the system but also the box or receptacle, I finally made up my mind that the fare box used on the Toronto Railway was probably the best, as it seemed to be a well made and ingenious device, the outcome of years of experience, particularly a slot in which the money was to be dropped, so arranged that the coin or ticket once entered, no matter how short a distance, could not be withdrawn, thus avoiding any slight-of-hand work on the part of the passenger. The coin or ticket dropped on a table or shelf that was easily and quickly seen by the conductor, and best of all, when the coin or ticket was tripped into the final receptacle it was utterly impossible for it to be extracted without breaking the box. In fact, I could not see that a fare box could be more perfect, unless it might be made to register the



number of times the table or shelf catching the money was tripped, which would be of very little value.

Having made up my mind as to the kind of box that I would use, and still believing most firmly that by its use we could: (1), collect more of our revenue than we did by allowing our conductors to handle it, and (2), that they would be relieved of a very large portion of their clerical work, I introduced the same on the cars of two of our best lines June 29, 1898. I first had these boxes turned into the office at the end of each trip, and caused the conductor to ring up his cash fare and transfer registers the same as usual (we use two registers), turning in his transfers each trip with the box, and giving the last number of each register. This, I soon found, required too large a clerical force in the office, and I accordingly lengthened the time out so as to take in the entire running time of each conductor, that is, they took their boxes at the beginning of their run and kept them until they came off duty, but turning transfer tickets each trip into the office with register readings, etc.

During the time of trial the receipts of both lines were very closely scrutinized and compared with like weeks and days of the year before and with similar seasons, considering weather, etc., and little or no appreciable increase in the receipts could be discovered, showing that our conductors were apparently dealing square with us or had some other way of beating us. We found that in crowded cars, for short distances especially, it was impossible to collect all of the fares, as the conductor was obliged to make change, and the people seemed desirous of causing delay purposely, in many cases putting five pennies into the boxes (which took just exactly as long as collecting five fares in the usual way), and generally required change, much more than usual. The operation was often as follows: Conductor would demand fare, party would hand him 25 cents, 50 cents or a dollar bill for change; conductor would make change and hand back same to passenger, who would count it once or twice, in some cases putting it into his pocket without dropping the fare in the box; conductor would call the attention of passenger to this fact and an argument would be the result, all of which, you will understand, would take much more time than simply making change by the conductor. Of course, the party would generally put the fare in the box; this is only one instance of many. The box had to be carried by the conductor, either in his hand or under his arm, as they did not like to carry it on a strap, and this was the cause of several trifling accidents, such as dropping the box on people's knees, shoulders and feet, causing no little trouble in this way. Notwithstanding the fact that we provided hooks for the purpose of hanging the boxes up out of the way, inside the car, we found it frequently the case that on account of having the box in his hand the conductor failed to catch the trolley when it jumped the wire in time to save it from striking the guy wires, etc. It was discovered that if the conductor desired to be dishonest he could be so just as well with the box as without it, in a crowded car, and the people encouraged it by assistance very often. We found that our patrons disliked the use of the box very much, and would insist upon not putting their fares into it, throwing them on the seat and floor, or handing them to the conductor to put in the box; all of which occurrences caused trouble and annoyance, but this antipathy, I believed, would soon wear off, when people become accustomed to them.

Summing it up, I find that the objections to the individual fare box are very much in the majority, the two things in its favor being: (1), the saving of labor by conductor in having no reports to make out, save the report of register readings, allowing him more time to the attention of his passengers, and (2), whatever was dropped into the box, be it buttons, dead nickles or bad money, belonged to the company, and no opportunity is given the conductor to distribute the company's revenue according to his own ideas, both of which are of great importance, but not sufficiently so, in my opinion, to overcome the objections previously stated, and therefore its use has been abandoned by this company, after using the same in the neighborhood of six weeks, during which time the men, as well as the officials, gave it a most fair trial.

While it would seem, from the above, that the individual fare box is not practical in the operation of a street railway doing a

large business, at the same time I am convinced that it would be a most excellent device for the use of lines with a light traffic, and would undoubtedly give them almost their entire revenue, with very little expense for inspection, etc., which can hardly be afforded by such lines.

This is my experience. I give it to the convention for what it is worth, and trust it may be of value to those who have had some idea of giving the system a trial. People have said to me that our citizens were too dishonest to admit of the system being a success in the United States. I don't believe one word of this, and have not the slightest doubt that we could use them on the entire Rochester Railway without trouble, if we so desired, as it really is no reflection upon the honesty of the men; on the contrary, to an honest man it removes all possibility of suspicion.

I am also equally certain that our men are as honest as can be found anywhere, and that in Toronto, Montreal or elsewhere, where boxes are used more fares are missed than would be stolen.

The "Springfield Republican" has wisely said: "Thus we are brought back to the necessity of recognizing that the honesty of the conductor must, to some extent, be presumed and relied upon. This is a factor which cannot possibly be entirely eliminated from the conduct of any corporation or business. Inspectors may be employed to watch, but who is to watch the inspector? And the wise corporation manager, who is acquainted with human nature, knows that a man's honesty is never improved by proceeding on the assumption that he is dishonest. The more effective way would seem to be to give the conductor a fair wage, reasonable hours and good treatment generally, and place him on his honor as a man to deal honestly in return."

On motion of J. P. E. Clark, a committee to nominate officers for the ensuing year was appointed, consisting of H. H. Littell, of Buffalo, Ira McCormack, of Brooklyn, and T. D. Rounds, of New York. The committee reported as follows:

President, G. Tracy Rogers, Binghamton.

First Vice-President, W. Caryl Ely, Niagara Falls.

Second Vice-President, Albert L. Johnson, Brooklyn.

Secretary and Treasurer, Henry A. Robinson, New York City.

Executive Committee: Herbert H. Vreeland, New York City; John W. McNamara, Albany; Henry W. Watson, Buffalo; Clinton L. Rossiter, Brooklyn.

The ticket was promptly elected by unanimous vote.

Ithaca was chosen as place for the next meeting.

Mr. Sugahara, of Japan, a guest of the convention, was invited to speak.

The convention then adjourned.

#### ENTERTAINMENT.

The entertainments provided by the local roads were highly enjoyed, and admirably conducted. Tuesday evening there was a special exhibition of fireworks, followed by the banquet, at which Hon. Tom L. Johnson presided. The dinner and speeches were both fine. The toasts were: "Our Host," by A. H. Stedman; "Transportation in Greater New York," H. H. Vreeland; "Our Best Patrons" (the ladies), Hon. A. B. Culver; "The Busy Boys" (our legislators), Hon. Jacob A. Cannon; and "Our Association," W. Caryl Ely.

Wednesday special cars to the navy yard, and in the afternoon a trip was made in a special steamer up the Hudson and down East river, an elaborate lunch being served on board. The local committee included C. L. Rossiter, A. L. Johnson and J. L. Hein.

After the convention Vice-President Drake, of the Nassau road, took a party on a special trip in President Johnson's private car, which is equipped with Christensen air brakes, Mr. Drake acting as motorman, and giving a very satisfactory demonstration of the brake under high speed.

In our August issue it was erroneously stated that F. J. Hoag had resigned the presidency of the Toledo, Bowling Green & Fremont Railway Company, and been succeeded by Edwin Jacoby. We are advised that Mr. Hoag is still president and that no change is contemplated.



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**PERSONAL.**

I. W. Miller, who resigned as superintendent of the Olean (N. Y.) Street Railway Company, has returned to that city and resumed his duties.

Geo. W. Knox, electrical engineer of the Chicago City Railway, brought his bride to the convention, and both were the recipients of many congratulations.

Frank Phillips, superintendent of the Brooklyn Avenue Street Railway Company, of Kansas City, has resigned. Political and business interests demand his attention.

Falen C. Moses, who is extensively interested in electric railways in the vicinity of Bath, Me., made an assignment on August 30, liabilities estimated at \$200,000.

H. R. Rasmussen, who has been a city employe of De Pere, Wis., has gone to Green Bay to fill the position of engineer for the Fox River Electric Railway Company.

E. H. Wells has been elected president of the Babcock & Wilcox Company, to succeed the late Mr. Bennett. Mr. Wells was formerly manager of sales, and his promotion is a well-merited recognition of his ability.

Garson Myers, manager of the Chicago office of the Christensen Air Brake Company, was overcome by the heat and unable to attend the Boston convention. For several days he was dangerously ill, but has now recovered.

T. Julian McGill, long with the Westinghouse Electric & Manufacturing Company, in Chicago, has been transferred to Minne-

apolis, to look after the northwest territory. His headquarters are at 515 Guaranty building, Minneapolis.

Joseph Miller, who has been master mechanic of the Columbus (O.) Street Railway Company for the past three years, has accepted a position in Ypsilanti, Mich. His fellow employes presented him with an I. O. O. F. watch charm as a token of their good will.

George W. Dunham is to be president of the Hartford & Springfield Street Railway Company, which is to be organized to complete the road undertaken by the Springfield & Southwestern Company to connect Springfield, Mass., and Hartford, Conn., and partially built.

Frank P. Welch, who has been superintendent of the Delaware (O.) Electric Street Railway Company, has left for the City of Mexico to enter the employ of the railway company there. Mr. Welch, by his former experience, is well qualified to have charge of the electric construction which is contemplated.

C. E. Loss, the well-known and successful railroad contractor, of Chicago, has just returned from Europe, where he enjoyed a well earned rest. Mr. Loss has been actively engaged the past two years in constructing the Bluff City line along the North Shore, connecting Waukegan, Ft. Sheridan, Highland Park and other points, and which is one of the longest and most interesting interurbans in the country. After completing his work Mr. Loss sold the entire property to advantage, and the line is now known as the Chicago & Milwaukee Railway. The work of securing franchises was unusually difficult, but was accomplished by Mr. Loss in the face of obstacles which would have discouraged most men. He is still connected with the road as director.

E. B. Gunn, superintendent of the Lafayette (Ind.) Street Railway Company was a caller on the REVIEW when in Chicago recently. Mr. Gunn states that his company carried 80,000 passengers during the nine days from August 28 to September 5, which included the county fair week and Labor Day.

F. E. Drake, of the Walker Company, has been selected as electrical adviser to Ferdinand Peck, commissioner general of the United States to the Paris Exposition of 1900. Mr. Drake sailed for France with the Commissioner General and party on the steamer La Touraine, from New York, on September 3. He expects to return to this country about the middle of October and will then resume his duties with the Walker Company.

D. W. Pugh, who for 40 years has been so prominently connected with the John Stephenson Company, is no longer with that concern, and will spend a few weeks with his son-in-law, F. D. Russell, of Rochester. Mr. Pugh has not yet fully decided which of several offers he will accept. His long experience, ability and popularity are well known. J. A. Tackaberry, who has also been connected with the Stephenson Company for so many years, has also severed his connection.

Norman Taylor Harrington, European agent of the E. P. Allis Company, was married to Miss Anna E. Spencer, of Milwaukee, on September 11. Mr. Harrington was setting up machinery in the street railway power station in Barcelona previous to the breaking out of hostilities with Spain. The U. S. consulate was assailed by a mob and Consul Bowen was defending the shield, which hung above the door, and was in great peril when Mr. Harrington came to his assistance, and they held the mob at bay until it was dispersed.

#### KNIGHT TEMPLARS AT PITTSBURG OCTOBER 10-14.

On account of the Knight Templar Triennial Conclave at Pittsburg October 10th to October 14th, the Baltimore & Ohio Railroad will sell tickets at one fare for the round trip from October 8th to 13th, inclusive. Tickets good for return passage leaving Pittsburg not later than October 17th. Tickets may be extended to October 31st on payment of 50 cents at time of deposit with Joint Agent at Pittsburg. See nearest B. & O. Ticket Agent for full particulars or address B. N. Austin, G. P. A., Chicago.

#### ELECTRIC ROAD FOR SHANGHAI.

Consul-General Goodnow, of Shanghai, reports to the State Department some details of a plan to build 18 miles of overhead trolley electric railways in that city:

The report of the special commission is again under discussion, and it is decided to include in the particulars both systems of gage ("standard" and "meter").

The following general particulars are ordered for publication: The electric overhead-trolley system is to be adopted.

The routes are to be three in number, viz:

- (1) From the French waterworks along the Chinese Bund (if practicable), and thence along the French and English Bunds, to the point by way of Broadway, Seward and Yantzeppoo roads.
- (2) From the Bund to the Bubbling Well, by way of Kiukiang, Kiangse, Haukau, and Naukin roads.
- (3) From the Shanghai Station of the Woosung-Shanghai Railway to the west gate of the Chinese city.

A concession is to be given for the construction of the line and all accessories to a syndicate or company, to be known as the "Shanghai Tramway Company." The concession is to be for 30, 40 or 50 years, according to the tender that the ratepayers may decide to accept, and the company is to pay the council a percentage of the total gross receipts for the period of the concession.

Notification to tenderers by public advertisement will follow in due course, and the tender finally selected will be submitted to the ratepayers for ratification.

#### CLAMBAKE OF THE AMERICAN ELECTRICAL WORKS.

The annual clambake, in celebration of the founding of the American Electrical Works, Providence, R. I., is an event of much importance to the electrical men of New England. The twentieth anniversary came at a most opportune time, the day following the adjournment of the A. S. R. A., Saturday, September 10. A large number of street railway men went from Boston to Providence where they were met by officials of the company with special cars. After a delightful ride through Providence, over the lines of the Union Railroad Company, the visitors arrived at Pomham Club. A cordial greeting was given to all at the clubhouse and each guest was provided with a numbered silk badge, an American Electrical Works souvenir, white linen cap and a briar wood pipe. The numbered badges showed considerably over 300 in attendance. At 10:30 a fine lunch was served and at 12:30 a sumptuous



AT THE AMERICAN ELECTRICAL WORKS' CLAMBAKE.

dinner was provided. The clambake proved a great attraction to the visitors from the west. A number of brilliant speeches concluded the dinner. Secretary T. C. Penington responded to the toast, "The American Street Railway Association," and Maurice Coster, manager of the Chicago office of the Westinghouse Electric & Manufacturing Company, made some felicitous remarks. Bowling, billiards, cards and rifle shooting furnished amusement and a hearty appetite for all. Every one gave unstinted praise to the generous hospitality of the company, and voted Eugene F. Phillips, president of the works, an ideal host. The Providence Albertype Company took photographs of the guests in a group and as may be seen there is a look of satisfaction on each face.

#### ILLINOIS STATE MEETING.

At the first annual meeting of the Illinois Street Railway Association, held in Chicago, June 7, it was decided to hold a special meeting at Aurora, Sept. 20. Secretary C. K. Minary has notified the members to this effect and a profitable and well attended meeting is anticipated.

The annual picnic of the employes of the Columbus Street Railway Company was held on August 26 at Olentangy Park. The schedule for the day was so arranged that each man could spend at least six hours at the park. The employes and the members of their families each wore a neat badge upon which was mounted a miniature nickel plated trolley wheel; no less than 2,000 of these were distributed. A band concert and a kinetoscope exhibition furnished the amusement for the evening. The officers of the company, President Sheldon, Vice-President Stewart, General Manager Kelly and Auditor Burington, enjoyed the picnic with the men, and their fellowship was much appreciated.



**THE "AUTO-MOTONEER."**

A controller governor or retarding device has been developed at the repair shops of the Chicago City Railway Company, which will doubtless receive much attention from street railway men for it is quite unique and a radical departure in controller operation. It has often been demonstrated that improper manipulation of the controller handle is very wasteful of current, and every railway company has rules and regulations covering this thoroughly. With all these rules and inspectors to teach the motormen how to handle the controllers, there is almost a universal disregard for both. The motormen become so accustomed to throw the controller handle around, regardless of the time that should be given to allow proper acceleration at each point, it has been the experience that even under the eye of the inspectors they continue this practice.

G. W. Knox, electrical engineer of the Chicago City Railway Company, has given the subject careful investigation and has formulated the losses due to the usual operation of the controller. The apparatus for automatically regulating the movement of the controller handle has been designed and patented by G. W. Knox. C. E. Moore, master mechanic, has assisted in working out the mechanical details of the apparatus.

The mechanism occupies so small a space that it can be placed within any controller case between the top of the drum and the hood of the case, and requires only the removal of a cam from the main drum shaft. The frame of the device carrying the entire mechanism is a small malleable iron casting held in place by two machine screws tapped into the back of the controller case. On the main drum shaft is a ratchet wheel having 12 notches, and a hole in the hub affords a stop in place of the cam removed.

On the frame is a lever escapement with two pawls, one pawl being always engaged. Two springs, one a 1/2-in. and the other a 1/4-in. closed coil spring, hold the pawls in place in the notches of the ratchet wheel.

Connected to the lever escapement is a link attached to a plunger of a dash pot 1 1/2 in. in diameter and 1 1/2 in. deep. The piston is 3/4 in. thick, with two iron packing rings. When the controller handle is turned one notch the air in the dash pot is compressed and holds the pawls firmly in position so that the handle cannot be turned another notch. In the bottom of the dash pot is a very small hole into which projects a needle-pointed screw, by which the area of the hole can be regulated.

As soon as the air escapes, one of the springs acts and frees a pawl so that the controller handle can be turned another notch. The time occupied by this action depends entirely upon the size of the hole in the dash pot. If it is large the air escapes rapidly and frees the pawl quickly, but if it is small, the reverse is the case. By means of experiments, the size of the hole can be nicely determined and the operation of the controller is automatically regulated. It is impossible for the motorman to turn the controller handle faster than the predetermined rate.

**EXCURSION RATES VIA UNION PACIFIC RAILROAD.**

If you contemplate a trip west, bear in mind Home-seekers' Excursion dates are next Tuesday, Sept. 20th, Oct. 4th and 18th, Nov. 1st and 15th, and Dec. 6th and 20th, one fare for the round trip plus \$2.00 from Chicago or territory up to Missouri River, to points in Kansas, Nebraska, Colorado, Wyoming, Utah and Idaho. Tickets will be good 21 days from date of sale and can be routed via Omaha or Kansas City. Stop over privileges will be granted in Home-seekers' territory. These tickets are first-class and good on all trains.

Through car service from Chicago to Denver, Salt Lake City, San Francisco, Portland and intermediate points. Trains are equipped with Pullman palace sleepers, Pullman tourist sleepers, free reclining chair cars, buffet library and smoking cars, and dining cars where meals are served a la carte.

Ask for tickets via Union Pacific R. R. For information address, W. T. Holly, General Agent, No. 206 S. Clark street, Chicago, or E. L. Lomax, G. A. & T. A., U. P. R. R., Omaha, Neb.

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## A BOSTON SOUVENIR.

Oh, a queer old town, but a dear old town,  
Is the home of the Bostonese.  
So modest and kind one expects to find  
Pantalettes on the limbs of the trees.

There the owls now hoot in a way astute—  
As all well-bred owls should do—  
And they plainly say in grammatical way  
"To whom" and not "to who."

Once the Kelley "slide" claimed old Boston's pride—  
John L. can still command it;  
But you mustn't insult her Ibsen cult  
By claiming you understand it.

In the paths obscure of freak literature  
Her work is certainly crowning;  
Boston's flies wear specks and she now subjects  
All beans to a course of Browning.\*

\*But a Boston intellect is not required to install the McRoy  
vitrified clay conduit—unskilled labor can do it.

## TESTS OF FORGED ENGINE SHAFTS.

The Bethlehem Iron Company, South Bethlehem, Pa., gives us the following data concerning some shafts for street railway engines forged by them:

A test of one of six fluid compressed, open hearth steel shafts, forged hollow on a mandrel for 7,500 h. p. engines built for the Metropolitan, New York, by E. P. Allis & Company, showed:

Elastic limit, 35,000 lbs. per sq. in.; elongation, 25 per cent. The dimensions are: Diameter of fly-wheel fit, 37 in.; diameter of journals, 34 in.; diameter of crank web fit, 30 in.; diameter of axial hole, 16 in.; length over all, 27 ft. 4 in.; weight, 70,000 lbs., estimated.

Two shafts of open hearth, hydraulic forged hollow on a mandrel and oil tempered for engines for the Boston Elevated Railway: Elastic limit, 45,000 lbs. per sq. in.; elongation, 20 per cent in test pieces 12 in. in diameter and 10 in. long. The dimensions are: Diameter of fly-wheel fit, 19 in.; diameter of journals, 17½ in.; diameter of axial hole, 6 in.; total length, 19 ft. 9½ in.; weight, 16,100 lbs.

One shaft of fluid compressed nickel steel, hydraulic forged on a mandrel and oil tempered, for the Boston Elevated Railway: Elastic limit, 50,000 lbs. per sq. in.; elongation, 18 per cent in test pieces 1 in. in diameter and 10 in. long. The dimensions are: Diameter of fly-wheel fit, 37 in.; diameter of journals, 34 in.; diameter of crank web fit, 32 in.; diameter of axial hole, 17½ in.; length, 27 ft. 10 in.; weight, 63,000 lbs., estimated.

The Metropolitan Street Railway Company, of New York, at the request of its employes, has waived its very stringent rule against the circulation of subscription papers among them, in order that the men may contribute to a fund for the relief of their sick and disabled companions who enlisted in the volunteer service. In all, some \$5 of the Metropolitan men enlisted.

The Camden (N. J.) & Suburban Railway Company has been reported as opposing asphalt paving for the streets in which its tracks are laid. This is not the case as the company has no objection to asphalt except between the rails where it considers a vitrified brick pavement more durable.

# The Motorman and His Duties

By Ludwig Gutmann.

145 Pages. 84 Illustrations. Cloth Binding. Price postpaid, \$1.00.

A valuable practical book for electricians, motormen and applicants for such positions. Written by a practical railway engineer.

Intelligent handling of the motor car saves money for the company. This book tells in plain, simple language how this can be done.

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### PART II.

- CHAPTER I.—The principles of the electric motor.
- CHAPTER II.—The electric railway motor and car equipment.
- CHAPTER III.—Controllers.
- CHAPTER IV.—Brakes and their construction.
- CHAPTER V.—Electric traction systems.

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#### CORRESPONDENCE.

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In our report of the meeting of the Street Railway Association of the State of New York, in the REVIEW for September, two of the papers read were omitted by reason of the manuscript not reaching up in time for publication in that issue. These were the paper of J. T. Little, Jr., of the Metropolitan Street Railway Company, on "The Relation Between the Public and Street Railway Companies," and the paper of W. J. Clark on "The Electric Railway as an Auxiliary Coast Defense." Both of these will be found in this issue and are well worth a careful perusal.

On another page will be found a description of the methods employed in Buenos Aires for handling dressed meat when transporting it from the abattoirs to the city either for local distribution or en route for export. The utilization of the tramways for the transportation of dressed meat is not a new thing in South American cities and has been the practice even with animal traction, but the adoption of electricity for the motive power could not fail to greatly improve the service and the new equipment provided is for handling heavier loads at higher speeds.

A similar service inaugurated by the street railway companies in American cities would undoubtedly be of great convenience and benefit to the people as well as the companies, and it might well be extended so as to care for a great deal of the other heavy hauling now done by trucks

and drays with animal traction. The objections raised to such expansions in the trolley field would doubtless be many; those now engaged in the trucking business would oppose the granting of express and freight franchises to the street railways because their business would be interfered with, and would stimulate the cheap politician to renewed attacks upon street railway "corporations." One great advantage resulting to the city, from such a service, that might be mentioned is the decreased expenditure for paving, the heavy wagon traffic being transferred to rails which are laid and maintained by the company.

There are some companies, however, which already are empowered to conduct such a business. In the July REVIEW was noted the fact that the Chicago General Railway had inaugurated a trolley cartage service to and from the freight houses of the 17 railroads which it intersects.

We note in another column the very successful history of the Metropolitan Street Railway Association, of New York, since it began to exercise its mutual benefit functions some 20 months ago. This association was organized among the employes of the Metropolitan Street Railway Company by President Vreeland first as a club, taking up later the aid features. The constitution of the association provides that the president and the treasurer of the railway company shall be ex-officio president and treasurer, respectively, of the association. The board of trustees are chosen half by the president and half by the association, so that while the members of the association direct the management of its finances they at all times have the benefit of the counsel of men more experienced in such matters than they themselves are apt to be. The second annual entertainment of the association was held on October 1 in Carnegie Hall, New York City, and was a great success.

The work of the American Street Railway Association has continued increasing in volume until it has reached a point where the time allotted is not sufficient for the accomplishment of the multitudinous features of the program, and while the two days which were ample 10 years ago have been doubled, the work and other features have quadrupled. We write this at a suggestion of a number of managers of prominent roads who expressed to us regret that they were able to find so little time for a careful inspection of the exhibits. The supplymen also have noted the growing demands upon the time of delegates and the consequent curtailing of the attendance in the exhibit hall, and while we have yet to hear the first complaint from them, they naturally feel that their efforts to present a creditable display are justly entitled to some positive recognition. They go to a great deal of trouble and make a large outlay in bringing and installing their appliances, and pay to the Association for rentals each year one-third of its total income.

We are convinced that the time has come when an inspection of exhibits should be made one of the program fixtures and assigned at least one half day (although that is too short to study the display carefully) which time shall not be cut into by any side attraction. There is no question that the visiting managers are just as anxious to make the inspection as exhibitors are to have them. The manager of one of the largest systems in the country remarked to us that really the only time he had to visit the exhibits was during the reading of the reports, after which he returned for the discussions;

and that he was obliged to make his examinations of the power plants during the evenings. That he was not alone in this is evidenced by the fact that during the reading of one of the most important papers only 25 persons were in the audience. Delegates said, we can read the papers in the published reports, but we cannot study the appliances from pictures.

No one who visited Boston would willingly have given up any of the many delightful trips and entertainments, and the same was true of St. Louis, and we hope will be of Chicago next year. The proposition therefore resolves itself into a question either of shortening the business sessions (which are already quite brief); of curtailing the excursions—which no one wants to do; or lengthening the convention period. Some advise less excursion and more time. Next year this may be practicable, for Boston was historic before Chicago was dreamed of, and we cannot hope to compete with the record of '98 along these lines. In any event in making up the assignment of time in '99 the exhibits should have early and commensurate consideration.

Elsewhere in this issue are the descriptions of three electric railway systems using alternating currents. The Middlebrough, Stockton & Thornaby Tramways represent the highest development of interurban railway in the United Kingdom. American ideas predominate in this system; in fact almost the entire equipment and machinery are of American manufacture. The manner of generating and distributing the current commends itself to railway men in this country, as it is the most advanced practice of today. Large generators supply three-phase alternating currents at 2,500 volts and these are transmitted at this potential to the substations and converted into a direct current at 500 volts. The transmission losses are very small.

An American engineer would never consider alternating currents for transmission on a road less than eight miles in length for the losses on a 500-volt circuit with feeders are not excessive at that distance. However, there are no Board of Trade regulations to contend with in this country. The requirement that the difference of potential between the generating station and the extreme ends of the lines must not exceed seven volts is not only well nigh impossible to fulfill, but is of no practical value. It adds nothing to the safety, comfort, or convenience to any community or municipality and in most cases is a most onerous condition for street railway designers to meet. Economy in transmission imposes a limit to the drop in voltage which should be recognized. There are many railways in operation with excessive line losses, reaching 20 to 25 per cent. The 500-volt transmission is not suited to long lines and extensions and small conductors.

The power plant of the Chicago & Milwaukee Electric Railway, described in the August REVIEW, is for the alternating currents transmitted at 5,500 volts. Objections have been raised to high voltages in cities, yet in the mammoth power house of the Metropolitan Street Railway Company, New York, the voltage for the alternating current transmission will be raised to 6,000. With good insulation and properly designed conduits the disadvantages of high voltages disappear even in crowded districts.

The Cripple Creek District Railway is a model type of interurban road receiving its current from a water fall. It is

safe to say that in the future wherever a water power of sufficient size to run a railway system is within 25 miles it will be developed to supply current for the system, the application of alternating currents making this possible. The greater part of the electric railway under construction is projected is between cities and towns, invading the street railroad field. Experience has shown that this can be successfully done between cities 20 to 30 miles apart. If this has been accomplished with direct current at 500 to 600 volts this distance can be greatly lengthened with alternating currents at 5,000 to 6,000 volts, for it is the transmission of the current which has heretofore placed a limit to such undertakings. The facility with which the voltage of alternating currents can be raised and lowered constitutes the only advantage over direct current for transmission.

The use of the alternating current motor would present many advantages for street car work. Those of the induction type dispense with the troublesome commutator, the question of insulation is of minor importance and there is little danger of excessive currents burning out the windings, but so far the difficulties of starting and regulating such motors have been insurmountable. Some are sanguine enough to predict that these problems will be solved in the near future. The fact that such motors are in successful operation on two or three lines in Europe justifies such a stand, although the necessity of the double trolley line counterbalances the advantages of the motors.

The single phase motor would require but one trolley wire; its fatal defect for railway work is its inadequate torque at starting, and it is at this time that the traction motor must develop maximum power. Until the alternating current motor can be operated from one trolley wire and have a starting torque 300 to 400 per cent above the running torque, as does the direct current motor, it cannot set up a claim as a competitor, however much its use may be desired. In itself the street car motor of today leaves little to be desired for it is light and compact, is reasonably efficient and requires little attention and repairs on a well organized road. In fact it seems that it is approaching the height of its development. The next step in advance, will be a motor with all the advantages of the direct and alternating current types which will greatly broaden the field for electric traction.

We believe the manager of what is known as the small road, will bear a reminder as to discipline. With many managers of roads operating say five to ten miles the feeling is that the great discrepancy in mileage and cars, number of employes and volume of receipts, is such that it is not necessary for him to be as particular in many matters of detail as his brother with the greater responsibilities. In some respects this is true, and he would be open to criticism did he spend as much in proportion for, say clerk hire, as a large road has to do. With his smaller force it is possible for him to have a personal knowledge of his men and operating incidents that on the large road is a physical impossibility, and there must be provided a system of records and men to keep them which is the next best thing. But there is no good reason why as thorough a discipline should not exist on the one as the other; in fact the superintendent of the smaller company has less excuse for failures in this respect.



These remarks are suggested by a ride taken a few days ago on a line operating some fifteen miles in a city of about 25,000. We were riding on the front platform of a car ten minutes late on a line less than two miles long. About four blocks from the business terminal we were stopped and held eight minutes by the tower wagon crew repairing an overhead guy wire, which repair was in no sense an emergency one. The car coming from the opposite direction was held even longer. After several requests from the motormen the wagon was removed from the track with its work far from completed. The line could just as well have been opened eight minutes earlier. In taking the wagon to the side of the street, which was a business street, and, at a crossing, the guy wire was allowed to hang over the trolley wire and dangle in the air within two feet of the ground. Although a dozen people were on the curb and in the street watching the operation no word of caution was given. The wire was safely recovered, but meanwhile one car with three passengers on the front platform, had approached to within six feet of the loose wire. However no damage occurred and the incident doubtless was never recalled by any of the witnesses, with the exception of the writer.

We were now eighteen minutes late, or a little more than the running time for the full half trip. Presently we approached a steam railroad crossing where the view either way from the front platform was badly obstructed by buildings. The car did not stop although it was brought down to perhaps three miles an hour. The conductor reached the front platform just as the front wheels struck the first steam rail, and looking both ways without getting off the conductor remarked, "I guess she's all right," and the crossing was passed. As events turned out it proved, or rather happened to be "all right;" but it was pure luck and not the result of any precaution on the part of the car crew that some of the seventeen passengers in the closed car were not mangled and killed. A little farther on a second crossing was reached, this time two tracks, and here the conductor got off from the rear platform and came ahead but it was "neck and neck" between him and the motorman as to which reached the other side first. A third crossing was signalled by the conductor in a manner but slightly better than the second. Near the end of the line the motorman stopped to pick up a half dozen young girls for a free ride of two or three blocks. Two small newsboys, one not over seven years of age, were carried several blocks on the lower step in exchange for a copy of the local paper.

On the return trip the crossings were run in a manner fairly commendable, though a positive improvement on the going trip. Both the men were bright, active and cautious, but they need discipline. All ethical reasons aside, a small road would suffer much more heavily from a serious damage claim than the large one, and the company in evidence could only pay a few thousand dollars at the expense of all its dividends for a year, hence its greater necessity, from a mercenary standpoint only, for exercising greater care.

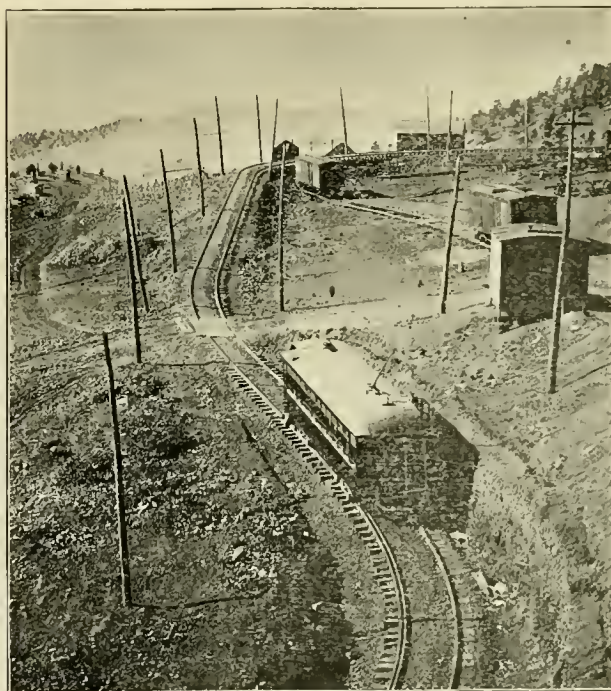
And now many managers will read this, and subscribe to the criticism, which is offered in a most kindly spirit, and will remark "that manager ought to correct that evil."

But are you sure it is not your own road?

## CRIPPLE CREEK DISTRICT RAILWAY.

By the introduction of the three-phase system of electrical transmission the development of the transformer of large capacity and the rotary converter, a great and lasting element of change has been brought into electric railway practice with ultimate consequences which escape the predictions of even the most sanguine. High tension three-phase alternating current reduced in transformers and changed in converters to low tension direct current for use with ordinary electric street cars was first employed at Portland, Ore. At Lowell, Mass., this method was first adopted for the operation of long interurban electric railway service, with gratifying success, and since then, in almost all cases involving a transmission of power, beyond the economical limits of the directly generated direct current, three-phase systems similar to those at Portland and Lowell are employed. For the operation of the great underground electric road in London and the no less great system of the Metropolitan Street Railway Company, of New York, involving intricate transmission and distribution, the three-phase system will also be used.

From Cripple Creek to Victor, in Colorado, runs the recently installed road of the Cripple Creek District Railway, First Division, a line some six miles long—the first installment of an interurban network which will eventually connect many of the busy mining towns of Colorado. As the road will ultimately cover long distances, the three-phase system with current generated at high pressure, transmitted, reduced and converted has been adopted as most suitable to the eventual demands. The source of the power is the flow from the different water sheds



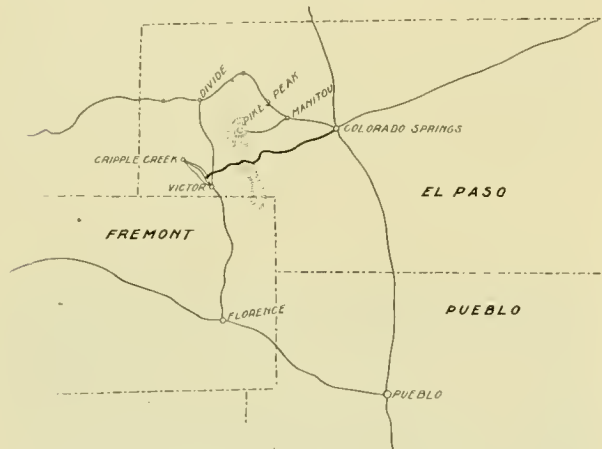
APPROACHING MIDWAY.

from Pike's Peak. The site of the power house is located a few hundred feet above Lake Moraine, in close proximity to the rack road leading from Manitou to Pike's Peak.

The water is brought through a riveted steel pipe line about 2,700 ft. long to a 4-ft. Pelton water wheel, running at 500 r. p. m. under a head of 700 ft. To the wheel is directly connected a 225-k. w., three-phase alternator, wound to deliver current directly to the line at a pressure of 6,300 volts and a periodicity of 25 cycles. The exciting current is obtained from a multipolar direct current generator, directly connected to an 18-in. water motor running at 1,400 r. p. m.

Previous to the installation of the three-phase generating plant, continuous railway current was furnished to the trolley line at 550 volts from the Cripple Creek lighting station, where the railway company installed a 225-k. w. multipolar direct current generator driven by an Arlington & Sims compound engine. This steam plant will be held as a reserve upon which to call in case of emergency.

The generating station switchboard is built of two blue Vermont marble panels, one for the generator and one for the exciter, equipped with the usual indicating, measuring and controlling instruments. The high potential switches are of the extremely quick-break type and are unprovided with handles, the opening of the blade being effected by means of a long stick with a hook at the end, which hook is inserted in an eye in the free end of the switch. The switch blades are separated from each other by marble barriers to eliminate all chance of arcing between the blades. In order to bring the blades away from the board both hinge and clips are mounted on corrugated rubber cones about 3½ in. high. Similar pyramids intervene between the back of the board and the high potential connections. Two sets of lightning arresters are used, one set being placed in the



MAP OF ROUTE.—HEAVY LINE SHOWS PROJECTED ROAD;

generating station itself and another in a lightning arrester house a few feet distant from the station. As the station and line are situated in a locality some 10,000 ft. above sea level, where electric storms are frequent, the necessity for reliable lightning arresters is forcibly brought home to the station manager at oft recurring intervals.

From the power house the circuits run over a pole line as far

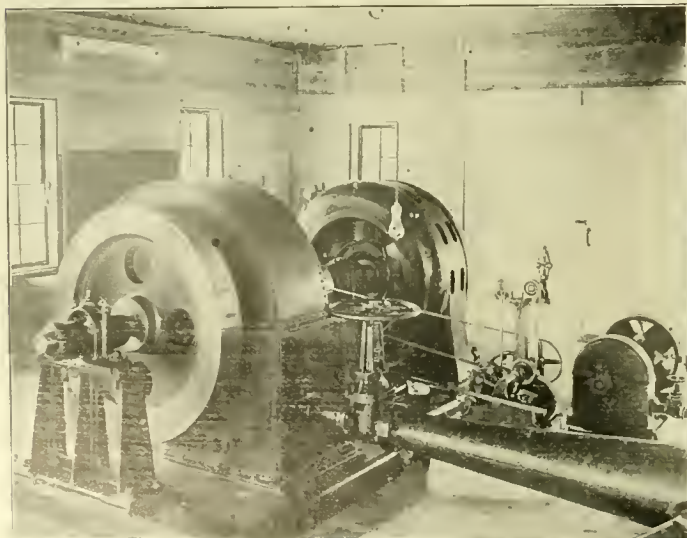
as the Horse Shoe Pass, the wires being strung on Locke triple petticoated high potential insulators. Along the tops of the poles runs a bare iron wire grounded every few poles, as an additional protection against lightning. The total length of the transmission line is about 9 miles.

The transformer and converter sub-station is located at Horse Shoe Pass, at the Station Midway, half-way between Victor and Cripple Creek and about midway between the terminals of the first division of the railroad. The reducing transformer equipment consists of three 75-k. w. transformers, cooled by a current of air forced up through the core and windings. In these the pressure is reduced to 350 volts, and at this pressure the three-phase current passes to one 200-k. w. rotary converter running at 750 r. p. m., and feeds to the trolley wire from the commutator side, direct railway current at a pressure of 550 volts. The switchboard in the sub-station consists of a single panel fully equipped with the necessary apparatus.

The line is 6.25 miles long, single track with two turn-outs and three spurs. It runs from Cripple Creek to Victor, with terminal facilities, car barns and offices being at the former town. The illustrations show clearly the nature of the country through which it passes. It may be said to be made up entirely of grades and curves, and, indeed, according to an engineer who recently inspected it, "There is not enough straight track on the whole road to make a decent crowbar!" The average grade between Cripple Creek and Midway is 6.09 per cent, the maximum rising to 7½ per cent. Between Midway station and Victor the average grade is 4.68 per cent. The track is laid with 60-lb. T rail on ties closely laid and well ballasted. It is bonded with terminal bonds of two No. 0000 copper wires. The track and roadbed have apparently been laid down with the sole end in view of permanency of installation and solidity of construction.

The rolling stock consists of three 40-ft. closed vestibuled double truck cars, manufactured by the Barney & Smith Car Company for the passenger service and one 33-ft. 6-in. double truck baggage and freight car. Each passenger car is equipped with two 50-h. p. motors with two series-parallel controllers, and the baggage car with four 35-h. p. motors and two controllers. All the cars are provided with Christensen air brakes and air whistles.

The road has been in operation since January 2, 1898, on a strictly railroad basis, with fixed time schedule. Since traffic was inaugurated, no trip has been lost nor have any difficulties been encountered not already provided for before actual operation was begun. The successful operation of this road goes far to prove that, even under the very severe conditions which obtain in this case, it is possible to maintain a perfect steam railroad schedule on a single track electric interurban road.



INTERIOR AND EXTERIOR OF GENERATING STATION.





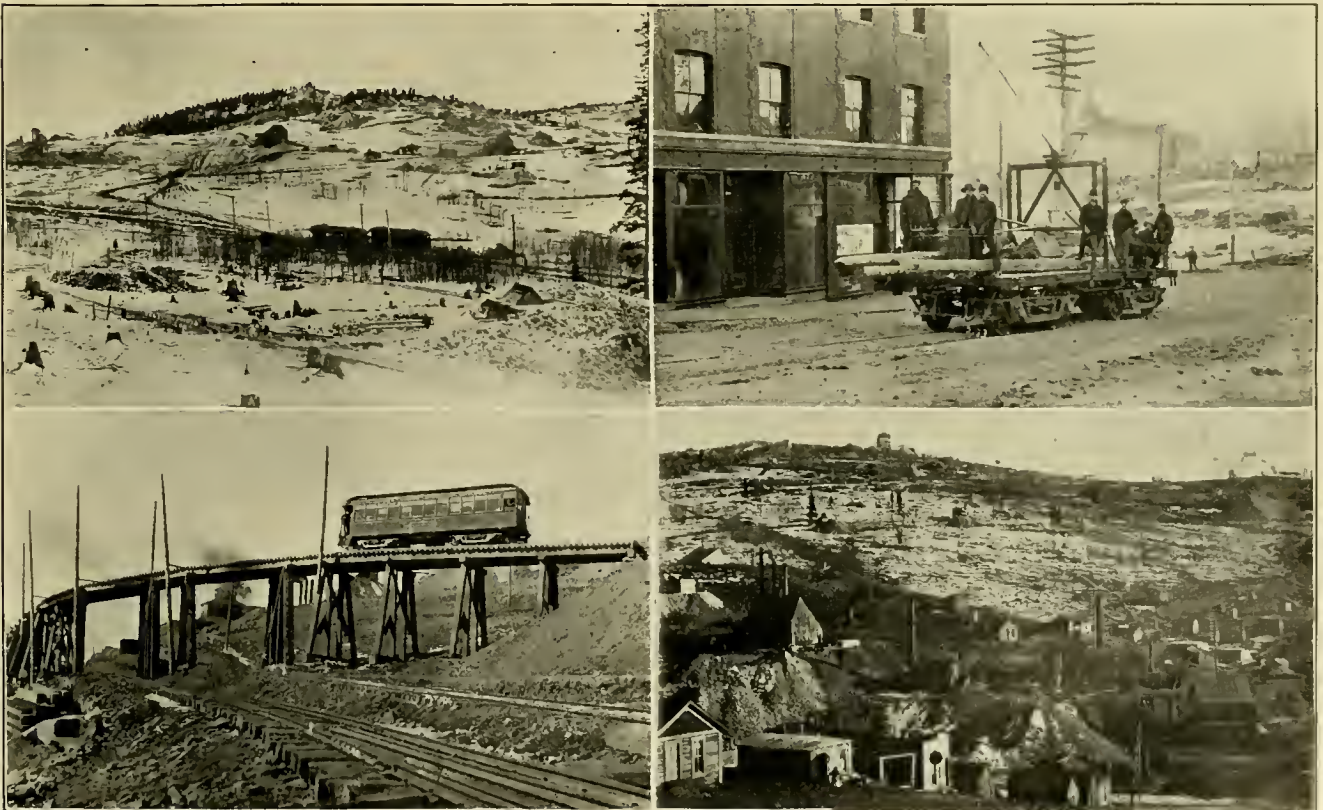
VIEW OF SILVERTON, COL., FROM THE CRIPPLE CREEK LINE.

The road has six stations—the terminals at Cripple Creek and Victor, and Anchoria, Midway, Windy Point and Dyer stations in the order named from Cripple Creek. The round trip is at present made in one hour and 29 minutes at an average speed of about 10 miles an hour, but this speed will shortly be increased to make a round trip between Cripple Creek and Victor in one hour. The road was promoted, constructed and is under the general management of L. D. Ross, vice-president of the company. H. I. Reid, formerly of Chicago, and later of Omaha, is chief engineer and electrician. Only passenger traffic has been

handled up to the present time, but the road has been built and equipment has been ordered to haul ore and other freight in the district. The road is building and will have in service within another 60 days four more passenger cars to take care of the passenger traffic alone. The road is set down as a money earner.

Surveys are now being conducted with a view to extending the line from the Horse Shoe Pass as far as Colorado Springs—a distance of about 32 miles—passing Lake Moraine and Bear Creek Cañon.

The work of construction on the extension it is expected will



SCENES ON THE CRIPPLE CREEK DISTRICT RAILWAY.—BARNEY & SMITH CAR EQUIPMENT.



shortly be begun. The current will be furnished on the three-phase system, generated by water-wheel-driven dynamos at high voltage, transformed down and converted at sub-stations in the manner identical with the installation which forms the subject of this article.

L. D. Ross, vice-president of the Cripple Creek District Railway Company, and who has promoted and constructed and had the general management of the road, began his railroad work 22 years ago as telegraph operator and had 10 years' experience in the different departments of steam railway companies, including the construction of 165 miles of new road. Ten years ago Mr. Ross became interested in electric railways, and has been identified with several successful companies. He came to Colorado in 1896, from Seattle, Wash., and upon his arrival in the Cripple Creek mining district saw the need of an electric railway to furnish cheap transportation to carry the miners to and from the mines, as well as to lessen the cost of hauling all kinds of freight, especially ore and coal.

Having thoroughly investigated the possible earnings of such a railway, Mr. Ross secured his franchises from the well populated towns of Cripple Creek, Victor and Gillett, and by proper survey located his electric line through the district, connecting the towns and principal shipping mines. He then went to London and associated with him in the enterprise English capital. On his return construction of the line between Cripple Creek and Victor was begun in June, 1897, and was completed and put in operation January 2, 1898. In the beginning of the construction of the electric line, he found the steam railways were much opposed to having their territory invaded by such cheap transportation, and as they controlled and made the price of coal in the district, he realized the necessity for having cheaper power. After making a thorough examination of all the water sources near the Cripple Creek district for the purpose of generating electric power by water power transmission plants, he found a large water power available in the Colorado Springs water system, and offered to the city of Colorado Springs for the use of this water to generate power for electric railway purposes, to extend the line from the Cripple Creek district to the city of Colorado Springs, a distance of 32 miles. He secured this franchise and completed his surveys, locating the line between the mining district and Colorado Springs, and while doing so, installed his first water power station at the head of Lake Moraine, transmitting power nine miles to the electric railway in the Cripple Creek district, completing same on July 2, 1898, and since that time has been operating the electric railway with this power. He expects shortly to begin construction of the main line to Colorado Springs, and hopes to have same completed and in operation within eight months.



L. D. ROSS.

### CONVERTIBLE CARS.

Anyone who has ever had the misfortune to take an open car in summer and be caught in a thunder storm en route can well appreciate one great advantage of a convertible car. The convertible car can quickly be made comfortable in wet weather, which is impossible with an open car, no matter how well provided with curtains it may be. There is, perhaps, some confusion as to just what is meant by the term "convertible"; the cars used on the Chicago & Milwaukee Electric Railway, illustrated in this issue are termed convertible by the maker, yet they differ from closed cars only in having the window glass and sash slide down into a recess where it is concealed by the sill folding over the opening.

We think the name should properly be restricted to those cars

in which the entire side panels may be removed, and so making the car really an open one and accessible from a running board along the side. That there is a demand for such cars, on the part of the public at least, appears evident from the fact that three such cars have been placed upon the market within a comparatively short time.

The pioneer was the "Duplex" car exhibited at Niagara Falls in October, 1897, and well remembered by the many who made the trip down the Gorge in it. This "Duplex" car was also shown at Boston, and several are in service on eastern roads. In this type the glass in the windows is bent to the arc of a circle and slides up into the roof in guides bent to the same radius; the lower panels are on the plan of the roller tops of desks and are plane when in position and accommodate themselves to the curved guides when raised. With this type the sash alone, or the whole panel may be lifted.

Another type of convertible car is that designed by George D. Musing, general manager of the road at Tampa, and illustrated in the REVIEW for July, last. This car has the alternate side panels only movable; they are in effect sliding doors, and when opened slide sidewise into the fixed panels.

A third type of convertible car is that shown at Boston last September by the J. G. Brill Company. In it the panels slide up into the upper part of the car, the windows and sash lower portions in separate grooves. In general appearance this car is more like the ordinary street car.

The convertible car is equally well adapted for winter and for summer service, and particularly so for spring and autumn use, when our changeable climate often demands a closed car one hour and an open one the next, if the passenger is to be comfortable. Only one set of such car bodies is necessary to equip the road. Whether the increased cost and the possible increased maintenance and repair charges will more than counterbalance the saving of having only one-half the car bodies and the gain in pleasure riding in suitable seasons can only be determined by trial, and it is gratifying that a number of roads are now making the trial. We believe that there are strong arguments for this type of car and shall await the results with interest.

### ANOTHER STREET RAILWAY FOR HONOLULU.

A few days ago the editor received a very interesting letter from Frank X. Cicott, who is making a tour of the globe. We last heard from Mr. Cicott from Australia; this time he writes from Honolulu under date of September 12, just before leaving for San Francisco, where he now is. He says that en route from Australia he visited the Fiji, Tonga, and the Samoan Islands, remaining several days at each place, and arriving at Honolulu the middle of August.

Mr. Cicott advises us that a new traction company has been organized with plenty of money behind it, and that it will proceed to build its road as soon as possible. The name of the company is the Honolulu Rapid Transit & Land Company, and the officers are: President, L. A. Thurston; vice-president, James B. Castle; secretary, J. A. Gilman; general manager, C. G. Ballentyne. The richest men in Honolulu are large shareholders, and among them are C. H. Atherton, James B. Castle, Charles S. Desky, McCandless Bros., Alexander Young & Co. and the estate of S. N. Castle.

General Manager Ballentyne contemplates a visit to the states to invite tenders for structural material and equipment; he will probably be here in December.

The gross earnings of the Brooklyn Rapid Transit Company's system have increased some 20 per cent within the last two years, basing the figures on the reports for the last quarter. For the quarter ending September 30, 1898, they were \$1,658,633, as against \$1,410,078 for 1897, and \$1,386,885 for 1896. For the month of September the receipts were \$534,941 in 1898, \$460,837 in 1897, and \$429,877 in 1896.





TYPE OF CAR.—PECKHAM TRUCKS.



STREET SCENE IN STOCKTON.

## INTERURBAN BETWEEN MIDDLESBROUGH, STOCKTON AND THORNABY, ENGLAND.

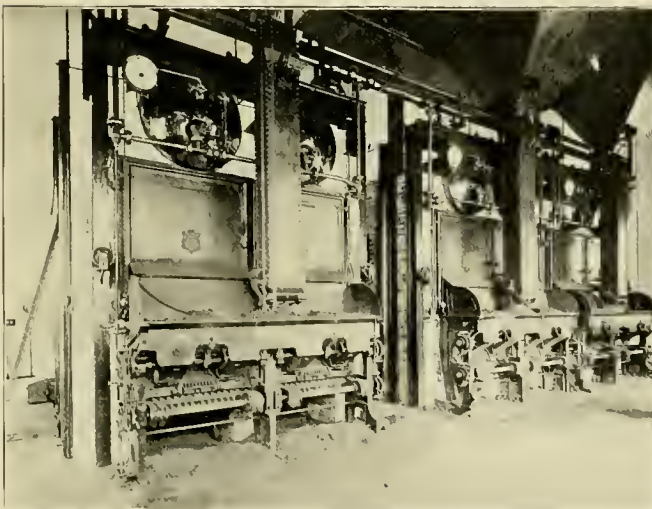
In spite of the difficulty of obtaining franchises, and the restrictions which handicap railway enterprises in English cities, steady progress is being made and it now seems that an era of railway construction is opening. The conditions in England are more favorable than in almost any other country for electric lines in and connecting cities. Not only are there many large cities, but the industrial centers are close together, affording a most attractive field for interurban railways. It is at this point where the craze for municipal ownership strikes an insurmountable barrier, as the municipal corporations are not empowered to construct railways outside of their own limits. This is a great point of advantage for private enterprise and will doubtless prove an entering wedge, introducing electric lines in many communities.

One of the most enterprising and active agents in promoting electric railways in the United Kingdom is the Imperial Tramway Company, of which J. Clifton Robinson is the managing director. This company has built and operates trolley systems in Bristol, Dublin and Middlesbrough, and has formulated plans for electric lines through the western suburbs of London. The latest undertaking completed by this company is the Middles-

brough, Stockton & Thornaby Electric Tramways, which in many respects represents the highest development of electric railways in Great Britain. J. Clifton Robinson, the engineer of the company, is thoroughly familiar with railway practice both in America and Europe, and embodies the best ideas in his lines and equipment, being singularly free from prejudice of foreign design and construction. Suiting these to local conditions the result in each case has been a tramway system up-to-date in every particular.

Middlesbrough, Thornaby and Stockton are manufacturing cities on the River Tees, in the north of England, near the North Sea. These cities, together with the villages through which the lines pass, contain a population of over 200,000. There are about 15 miles of track, all of which is double except in the sparsely settled district between Middlesbrough and Thornaby. The lines are laid in the principal thoroughfares of each city, there being but one branch line which is 1½ miles long connecting a populous resident district of Middlesbrough with the business center. As may be noted from the view of High street, in Stockton, it presents a very busy scene. One thing peculiar to the American eye is that the cars run in an opposite direction from what they do in our own cities.

The roadbed throughout is of substantial construction, having a foundation of Portland cement concrete 6 in. deep. Grooved rails, weighing 92½ lbs. to the yard were laid on this and tied



BOILER ROOM.—BABCOCK & WILCOX BOILERS.



GREEN ECONOMIZERS.



together by steel rods at intervals of 10 ft. The rails are electrically connected by the "Columbia" bond, made by the Harrington Rail Bonding Company, New York.

Perhaps the most notable feature of the system is the power station. In order to locate the station advantageously on the river in Stockton and conform with the Board of Trade regulation, which permits a difference of potential between the generator and the end of the lines of only 7 volts, a three-phase, 2,500-volt transmission was adopted. There are three generators, each of 300 k. w. capacity, having 32 poles, giving 2,500 volts with a frequency of 25 at 94 r. p. m. The current for exciting the fields is taken from the line circuit at the switchboard. To provide an exciting current to start the machines, a strong battery was installed. The view in the battery room shows 260 cells which also supply current for lighting the station. The discharge rate of the battery is from 48 to 70 amperes with a capacity of 240 ampere-hours. The current for charging the cells is taken from the 500-volt circuit and passes through a booster which can raise the voltage to 650.

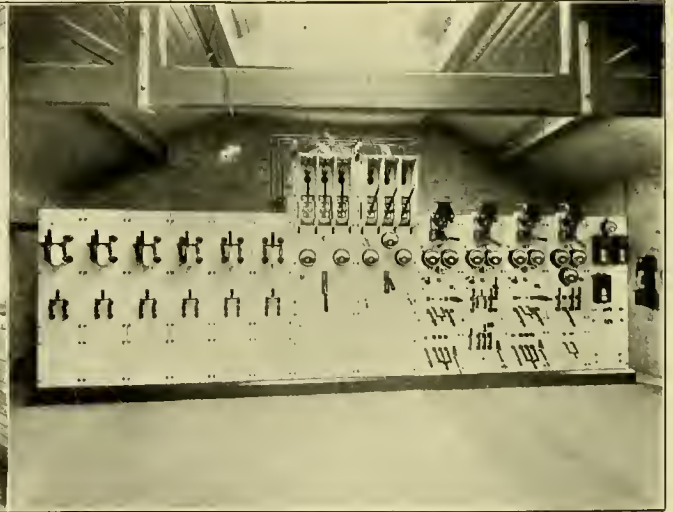
At the power station there are step-down transformers reducing the voltage from 2,500 to 320, and two 200-k. w. rotary con-

verters deliver a direct current of 500 volts to the switchboard. The lines for two miles on either side of the station are fed from the main switchboard. Three-phase alternating currents are transmitted three miles to the sub-station over two three-core cables at a loss of only 5 per cent. Here the voltage is reduced by the transformers and changed to a direct current by three rotary converters to be distributed to the rest of the system. The main switchboard, shown in the cut, consists of white marble panels. The instruments are mostly of American makes, Weston ammeters and voltmeters being used.

Direct connected to each of the generators is a slow-speed, horizontal cross-compound, condensing Reynolds Corliss engine, made by the E. P. Allis Company, of Milwaukee. The cylinder dimensions are 16 and 36x32 in. The engine room is 52x100 ft., and along its entire length is a track for a 10-ton traveling crane. In the boiler room there are three Babcock & Wilcox water tube boilers, provided with mechanical stokers. A Green economizer of 210 tubes is shown in part in the illustration. Overhead in the boiler room are steel coal storage bins from which the coal is fed to the stokers by gravity. An electric crane on the wharf hoists the coal direct from the vessels, and after it is automatically weighed it is conveyed to the bins, which have a storage capacity of about 300 tons.



STORAGE BATTERY ROOM.



SWITCHBOARD.—WESTON INSTRUMENTS.

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The trolley wire is No. 000 hard drawn copper and is carried on steel tube poles spaced 120 ft. apart. There are now 35 motor

## TRAMWAY SPEEDS.

From the report by M. H. Geron, manager of the Cologne Tramways, read before the Permanent International Tramway Union at Geneva, and translated in the "Railway World," London.

The question of the most suitable speed for light railways, and particularly for tramways, is one of the most frequently discussed problems of management. The successful solution of the question equally concerns public authorities, passengers, shareholders, and especially in the case of tramways, the general street traffic. All progress in the industry of transportation is intimately bound up with the increase of speed, and such is particularly the case for tramways carrying passengers, to which the present discussion is limited.

Replies to inquiries regarding speeds have been made by 21 tramway companies; eight of these companies operate their lines by steam, five by electricity, five by horses, one by compressed air, and two by a combination of one or more of these methods. The replies come from Belgium, France, Germany, Italy, and Austria, so that they furnish a representative series, and enable us to render a sufficiently complete account of the state of the question.

Confining ourselves to the data contained in these replies, we will sub-divide the tramways, as regards speed, into two classes,



viz.: suburban line, worked principally by steam, and urban lines, worked principally by electricity and horses. Speed is naturally greater in the first class than in the second. On lines having an independent right of way the speed depends almost exclusively on technical and economic considerations. Increase in speed requires more perfect construction and equipment, and, therefore, entails greater cost for track and rolling stock, so that the expense for working and maintenance becomes greater. On the other hand, increased speed is popular with the public, and brings as a consequence increased receipts. It is notorious that experience since the inception of railways has been and still is favorable to an increase of speed, and this is true for light railways as well as trunk lines.

With respect to tramways the situation is notably different. Here, speed is not simply a technical and economic question, but one that depends, besides, upon the general condition of the traffic in the streets, the danger of accidents, and all the local circumstances of traffic. It follows from this that the question presents itself to managers of street railways under an entirely different aspect than in the case of lines having their own permanent way, and the solution in the case of the former becomes much more difficult. For this reason we shall deal especially with urban undertakings in which the obstacles and the dangers presented by the traffic in the streets acquire greater importance.

We should here make another distinction, viz.: between tramways worked by mechanical traction and animal traction. In the first it is technically possible to attain without difficulty speeds which pass the limits imposed by local conditions, while with animal traction the very nature of the motor—that is, of the horse—places a limit which cannot be exceeded, and which does not allow the attainment of a speed which local conditions would permit. In the examination of the replies received, we will express, in order to simplify matters, the speed in kilometres and miles per hour. We will also describe the speed obtained by dividing the length of the route by the duration of the journey, including stoppages, as “commercial speed,” and the speed which must in no case be exceeded as the “maximum speed.”

On the Italian tramways the maximum speeds are 16, 18 and 20 kilometers per hour (9.9, 11.2 and 12.4 miles per hour), and these are reduced to 6, 8, 10 or 12 kilometers in densely crowded streets and difficult passages, as the company thinks that the official maxima might very well be raised to 24 kilometers in ordinary street running, and to 30 kilometers (18.6 miles) on independent permanent way, and these speeds were even proposed by the authorities in a measure which, however, did not become a law. This projected law laid down 24 kilometers as a maximum at any point, and there were special rules for falling gradients, curves, crossings and other dangerous points, and also at night time. For railways constructed on ordinary roads the speed is limited to 30 kilometers, with similar restrictions as to grades, etc., prescribed for tramways.

The Belgian National Company of local railways limits its speed in populous districts to 7 and 10 kilometers, and at other parts to 14 and 17 kilometers. Without special authorization the speed of trains outside crowded districts must not exceed 30 kilometers, to be reduced to 10 when passing through villages and towns, and speed must be slackened when the approach of a train might frighten horses and other animals, and possibly lead to accident.

The management of the steam tramways of Bologna have failed in their application for power to increase speeds up to 22 kilometers from the present 18 kilometers limit. Other Italian lines are limited—at Milan to 18 to 20, Turin Province 20, and the steam tramways at Rome, Milan and Bologna to 20 kilometers. All join in the opinion that speeds might be increased without additional danger and with additional profit.

At Crefeld, the German tramways are limited to 12 kilometers in populous centers, and 20 outside, and the so-called commercial speed only reaches 12 or 13, with this 20 maximum. Several accidents early in the life of the line caused the reduction from the original speed of 15 to as low as even ten kilometers, beyond which it only recovered to the above 12 and 20.

The Belgian National Company's rules best conform to practical necessities, and the propositions submitted to the Italian

legislature closely resemble them. The Belgian local railway system now includes 1,500 kilometers and will soon be doubled.

As appears from the reply of the Belgian Company of Local Railways, the management was consulted when the limits of speed were fixed and the rules formulated in such a way as to give satisfaction to both parties. This method is certainly commendable; and we would like to express the wish to see the rules submitted to frequent revision by taking the opinion of all those interested. The regulations were formulated originally by the authorities in a spirit of prudence, but as soon as newly established railways and tramways have become familiar, and travelers and the public have grown accustomed to the new mode of transport, an increase of speed is often desirable. Everyone agrees in saying that the receipts increase with the speed, and this is in fact a proof that an addition to the speed meets public approval. On the other hand, it has not been shown that the number of accidents has increased where an increase in speed has been authorized, and we must attribute this fact to the circumstance that the public has grown accustomed to street railways.

On the electric tramways of Aix-la-Chapelle, partly in the city and partly in the suburbs, the maximum authorized speeds are 12 and 16 kilometers (7.44 and 9.92 miles), respectively. At Baden-Vöslau, the speeds are 25 kilometers (15.5 miles) on the company's own right of way; 18 kilometers (11.16 miles) during the day, and 14 kilometers (8.68 miles) at night on country roads, and 14 kilometers in the city; the minimum speed is 10 kilometers (6.2 miles); under these conditions the “commercial speeds” on two lines are 6.99 and 9.30 miles per hour.

At Gera the authorized speeds are 12 kilometers (7.44 miles) within and 20 kilometers (12.4 miles) without the city. At Hamburg the speeds are 6, 12 and 18 kilometers. At Zwickau, 12 kilometers within and 16 kilometers without the city; the electric cars here make a speed of 9.6 kilometers (5.95 miles), including stops.

All of these electric companies believe that higher speeds would result in larger receipts, without either increase of accidents or larger working costs.

The Mekarski compressed air line in Paris has a “commercial speed” of 10.75 kilometers (6.66 miles). By French law the maximum is 12 kilometers in cities and 20 in the country.

The following list shows the “commercial speed” on several horse tramways:

	Maximum Speeds	
	Kilometers.	Miles.
Tramways of Frankfort.....	10.2 to 10.8	6.32 to 6.7
Tramways of Florence.....	10.2 to 9.9	6.32 to 6.13
Tramways of Magdebourg.....	10.2 to 9.5	6.32 to 5.89
Tramways of Heidelberg.....	10.2 to 8	6.32 to 4.96
Tramways of Prague.....	10.2 to 6	6.32 to 3.72

The two companies first mentioned remark that a successive increase of speed has resulted not only in an increase of receipts, but also in expenses. As to this last, the Frankfort tramways company estimated a 30 per cent increase in the horse account, but it adds that increase in receipts exceeds that in expenses.

It is singular, that in spite of the great difference in speeds reported by the various companies, ranging from 6 to 10.8 kilometers (3.72 to 6.7 miles) per hour, they all consider as the most practical speed that which they have adopted. A fact worthy of notice is, that the speed on the Frankfort tramways, 10.8 kilometers (6.7 miles), corresponds closely to the speed of the two lines of steam tramways of Florence, 10.6 and 9.9 kilometers (6.57, 6.13 miles); to that of the electric tramways of Zwickau, 9.6 kilometers (5.95 miles); and to that of the compressed air tramways at Paris, 10.75 kilometers (6.66 miles).

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The through electric trains over the Brooklyn bridge have been discontinued during rush hours, exactly reversing the previous plan. The reasons given are that by running only the local bridge cars at these hours a much shorter headway can be maintained and the public better accommodated. Passengers are transferred to their destinations without extra charge.

## THE METROPOLITAN STREET RAILWAY ASSOCIATION.

In the REVIEW for March, 1897, was published a short account of the Metropolitan Street Railway Association, of New York, started by President Vreeland, of the Metropolitan Street Railway Company, as a club, and afterwards made a mutual aid society. It started in business February 1, 1897, with a membership of 1,120, which has now increased to 2,604 and is still growing. The statement of the association, as published in a recent circular to the members, shows that in the year just closed dues were collected to the amount of nearly \$14,000, and the total income was \$22,800. Sick benefits were paid to the amount of \$9,255 death claims, \$3,547, and medical fees, \$2,257.

Membership in the association is voluntary but is limited to the employes of the company. There are no salaried officers, and a physician is its only salaried employe. It pays no rent. It has \$5,000 invested in bonds of the company, now worth \$5,600, on which it draws 5 per cent interest. The bank balance is \$2,751.18.

The advantages of membership are thus stated in the circular: "For an initiation fee of \$1 and dues of 50 cents per month you get \$1 per day when you are sick, \$150 in life insurance, free attendance by a thoroughly competent physician, whose whole time is devoted to the association members. He is in attendance at the association rooms daily from 11 to 12 o'clock and on Thursday evenings from 8 to 9 o'clock, where you can consult him. In case you are confined at home, he will visit you, and the association druggist will furnish you medicine at reduced rates.

"You can, without charge, use the association library, which comprises about 1,200 volumes by the best authors, and take its books home to be read if you do not wish to remain in the association rooms."

The president of the association is the president of the company, the vice-president is chosen by the members, the treasurer is the treasurer of the company; the board of trustees consists of six members, three appointed by the president and three elected by the association, and the board chooses a secretary.

On October 1 the association gave its second annual public entertainment, which was held in Carnegie Hall, New York City, and was a great success. The evidences of cordial sympathy between the president of the company and its officers and employes were very marked and quite suggestive to the outsider.

The Titusville (Pa.) Electric Traction Company has agreed to build a new cinder bicycle path to replace the one torn up in building its line to Hydetown.

## A RECONSTRUCTED STATION, CINCINNATI.

The Cincinnati Street Railway Company began the operation of some of its lines by electricity as early as 1889 and the peculiarity characterizing the system was the adoption of the double trolley. The next year after electricity was applied as a motive power the Hunt street station was built to furnish current to the lines near the center of the city. Its first design included



FIG. 1.—HUNT STREET POWER STATION.

three simple Corliss engines, 16 T-H D-62 generators belted to jack shafts, with an ultimate capacity for the station of 2,000 h. p.

The growth of the system required a station of much greater capacity and it was recently decided to reconstruct the Hunt street station, putting in larger and more powerful engines, generators and boilers, at the same time making use of the buildings and portions of the old equipment. As the current generated by the old machinery was required for the daily operation of the lines, the new machinery was installed with the least possible interference in the operation of the old.

The exterior of the building is shown in Fig. 1; Fig. 2 is a cross-section, and Fig. 3 a plan of the station. The interior dimensions of the engine room are 71 ft. 6 in. x 196 ft.; the boiler

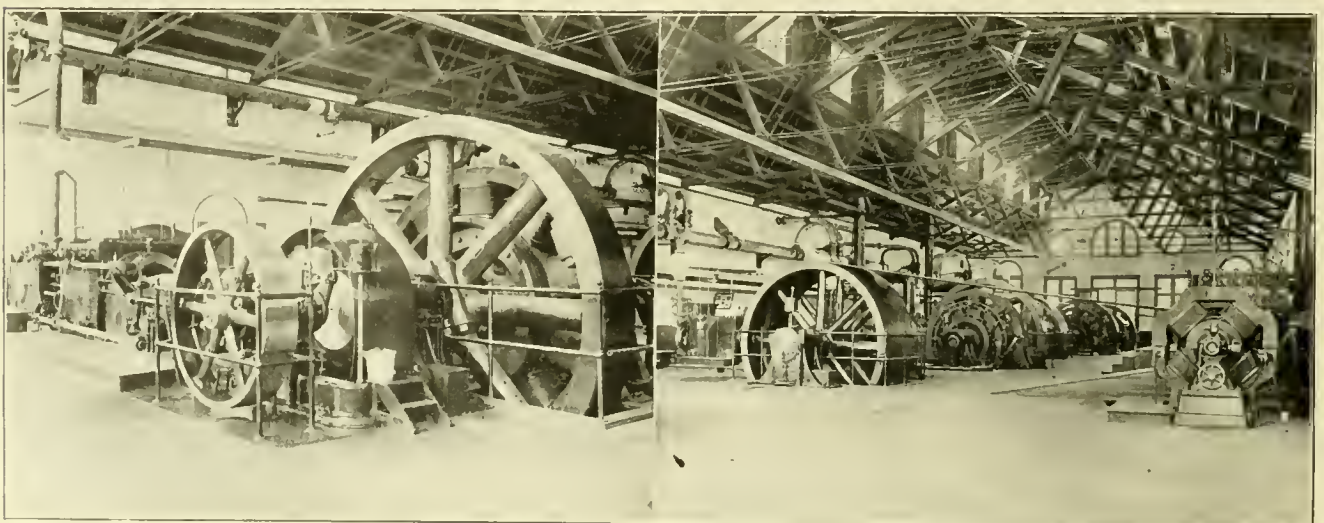


FIG. 4.—VIEWS OF THE ENGINE ROOM.—MCINTOSH-SEYMOUR ENGINES.—FIG. 5.



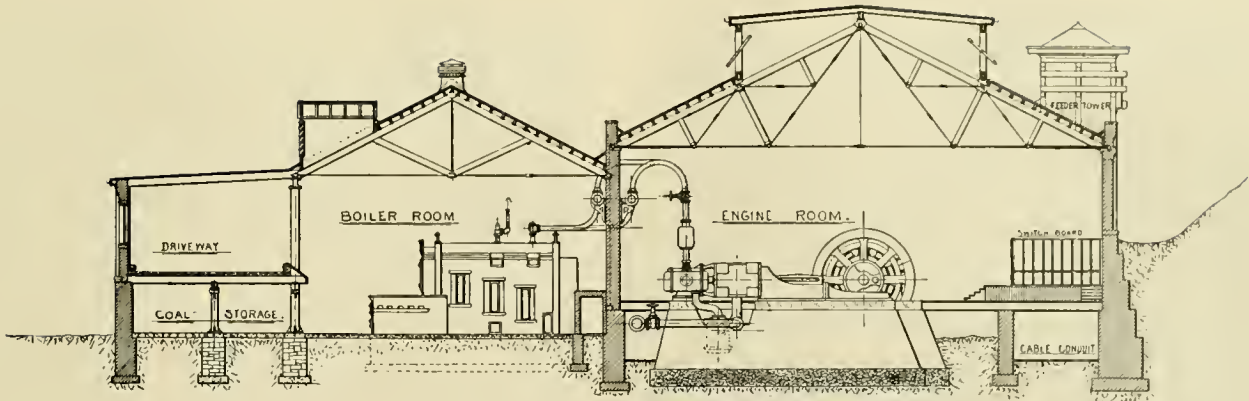


FIG. 2.—CROSS SECTION OF STATION.

room, 48x196 ft. and the coal storage annex, 26x196 ft. The six engines are compound non-condensing, built by McIntosh, Seymour & Co., and aggregate 8,000 h. p. Nos. 1 and 2 are 26 and 42x42 in. with gridiron valves on the high and low pressure cylinders and each drives an 800-k. w. generator at 100 r. p. m. Engines Nos. 4 and 6 are 25 and 40x42 in. with piston valves, and also direct connected to 800-k. w. generators. Fig. 4 shows one of the large direct connected units. The two 21 and 32x36 in. engines are each belted to two 300-k. w. generators, hav-

ing a speed of 400 r. p. m. Fig. 5 is from a general view in the engine room. Each engine is connected to two separate steam mains, one in the engine and the other in the boiler room, as shown in Figs. 2 and 3. This duplicate piping was intended to provide a safeguard against any accident to the steam plant likely to occur. The enameled slate switchboard is equipped with the usual instruments, including a total current ammeter and wattmeter.

The steam for the plant is generated by four Babcock & Wilcox

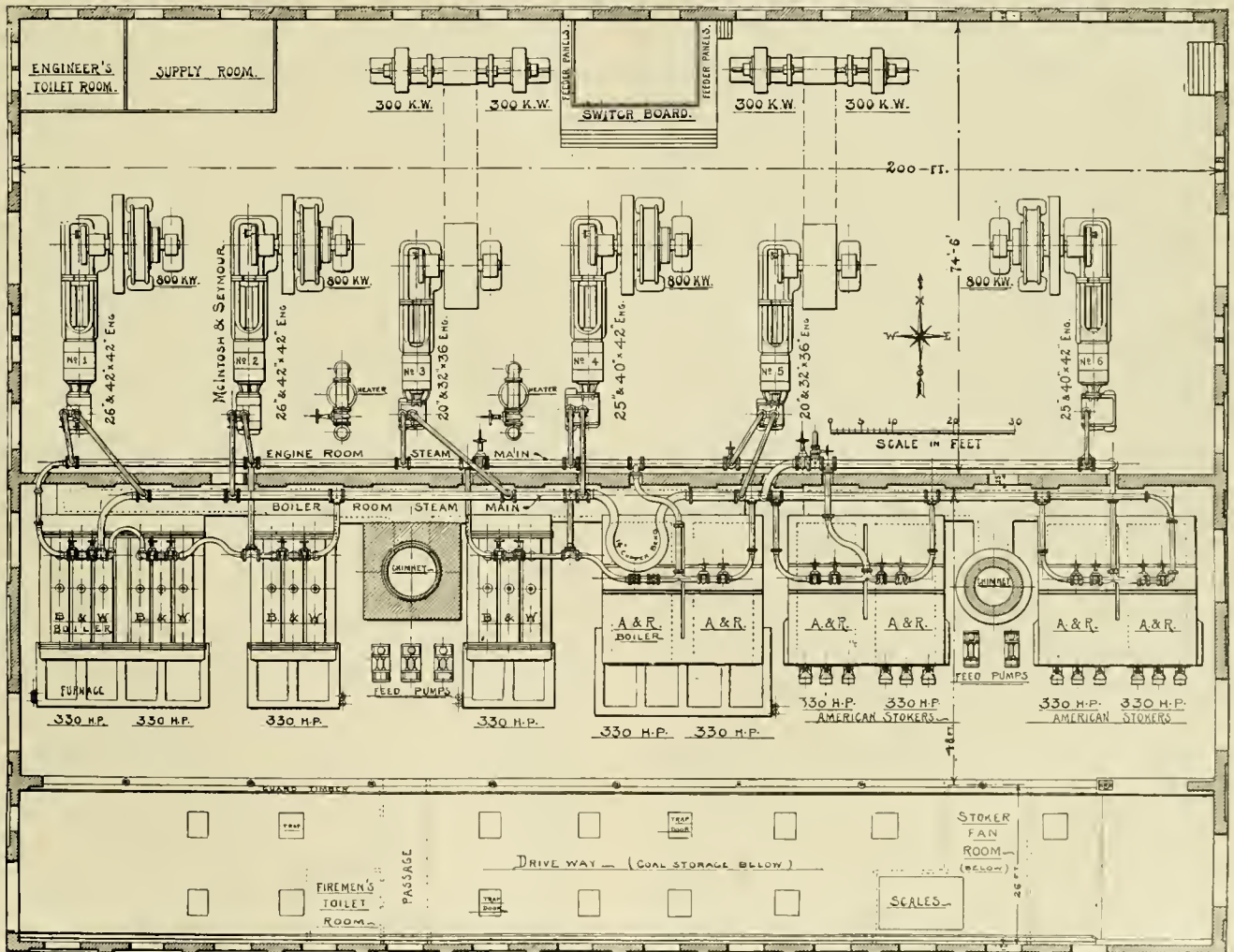


FIG. 3.—PLAN OF HUNT STREET STATION, CINCINNATI STREET RAILWAY COMPANY.

and six Abendroth & Root boilers, each of which has a heating surface of 3,600 sq. ft. and to these boilers are attached automatic stokers, four being of the American type.

The boilers are of the horizontal water tube type and each is rated at 330 h. p., although in actual service they develop 500 h. p. each. The heaters, feed pumps and pipes are in duplicate and the water is taken from two independent mains. The coal is delivered from a raised platform and dumped directly in front of the boilers but it is also arranged so that the coal may be dumped through trap doors in the platform to the coal bins below.

The feeders consist of 20 pairs of 500,000 c. m. cables furnishing current to from 125 to 200 cars. The load on the station for the heaviest average day's work is 4,500 amperes, but the demand sometimes exceeds 6,500 amperes. Current is supplied to the lines in the central portions of the city, including the heavy grades leading to Walnut Hills, Avondale, Mt. Auburn and Clifton. J. A. Collins, secretary and assistant general manager of the company, has kindly furnished the data for this article.

## THE RELATION BETWEEN THE PUBLIC AND STREET RAILWAY COMPANIES.

BY J. T. LITTLE, JR.

Read before the Street Railway Association of the State of New York.

It seems to be quite necessary that papers read before gatherings such as this should be upon some particular subject and duly entitled; therefore, this paper has been placed upon the programme as an effort upon the "Relation between the Public and Street Railways." The object of a title is somewhat obscure, for the text of the paper seldom conforms with the subject suggested. So, it may be assumed, there being reason in all things, that papers are labelled to enable the hearers to remember that something was read on a certain subject, and for the consequent purpose of enabling them to forego the burden of charging their minds with, or listening to the contents thereof.

The relation between the public and street railway is certainly a comprehensive subject, and was selected partly with the idea that, in reply to the question of some unnecessarily inquisitive friend who did not avail himself of the feast (or the one to-night), "What was in that paper?" the delegate, relieved of the necessity of remembering, or blessed with sublime forgetfulness, may substitute some of his own experiences, or ideas (with the author's full permission.) Now you cannot do that with such a subject as "The Metallic Circuit," or "Fenders, their Advantage and Disadvantage," or "Low Joints: How to remedy them; How to prevent them;" nor could the author be so generous as to permit it.

Perhaps it would have been better to have started in this fashion: "The Public—What they want and what they receive. What they are entitled to; and what they should grant."

Here the difficulty lies. What they want and what they receive is simply the question of the president and his operating staff trying to please two or three million people, and the two or three million people being pleased by the few officials. It cannot be done. One can only accomplish the best he knows how. And by the "public" is meant not only those who ride in street cars, but also the property owners, shop-keepers, municipal authorities, departments, advertisers, litigants, claimants, lawyers, ambulance chasers, injured persons, frauds, truck drivers, carriage drivers, and everything that goes to make up a community. In the successful operation of the street railway, the public is an important—more, the essential factor. It must be pleased, pacified and placated. Between the public and the street railway company, harmony must be the watchword, even more so than between the leaders of great political parties.

The street railway of today is vastly more than a mere private institution. It, in no wise, can be likened to the old stage coaches, no more than the steam railways can be to the post coaches so realistically portrayed by Dickens. The street railway is engaged in the discharge of a public duty, and that is by no means the lesser object of its existence.

With the improvements in motive power, the street railway begins to vie with the steam railroads as a means of inter-rural and interurban transit. Its obligations to the public are greater than in the past; and, likewise, the reciprocal obligations of the public to the street railways are increased. However the obligations of the railways are tenaciously guarded by the press and a horde of lawyers, while the obligations of the public are drowned in the popular idea that the railway companies are enjoying the privileges of invaluable franchises, without adequate return. The public today is clamoring for rapid transit—a quick and absolutely safe transportation from homes to businesses. The trolley car is required to run rapidly and smoothly. Its speed is required by public sentiment to be so fast as to entitle it to be compared with steam railroads, and yet a steam railroad is the owner of its roadbed, and has absolute control thereof, while a street railway shares the thoroughfare with trucks, jealous cabbies, pedestrians, aged and infirm, young and unattended. A steam railroad train stops at stations, at intervals; a street car stops on signal; and people board and alight from a street car at all places, and at all speeds. A street railway has not even full control of the part of the streets where its tracks are laid, and the public holds street railway companies amenable upon more rigorous terms than are applied to any other species of private corporation. Consequently, it seems to be ordained that the traveling public, whose cry is for speedy transportation, is beset with obstacles imposed by other conditions, while the public on the streets often vents its anger at the excessive speed of the cars, when the preoccupation of the mind has been the cause of an uncomfortable proximity to one of those moving houses, which seems in itself to stamp as frivolous the excuse of any man, in the exercise of sound judgment, "that he didn't see it." How is the public best pleased and best subserved, to the satisfaction of all concerned, is the thought here suggested?

Why it is that the presumptions are always against the street railway companies, and in favor of the public? The individual mind is the integral part of the general mind of the public, and one or two illustrations of the diversity of an individual mind might be in place.

The city of New York desired to honor the returning heroes of the 71st regiment, recently. The boys were to march up Broadway, and the management of the street railway company, in that city, suspended the operations of the cars on that portion of the streets over which the procession passed, so as not to interfere therewith. More than that, cars were supplied to convey the sick and wounded, free of charge, to as near their destination as possible. The line of procession turned into Fifth avenue, and proceeded up that thoroughfare, crossing at Madison Square, Broadway and Twenty-third street, thereby blocking four or five lines of street railways for half an hour, or more. As might be supposed, a crowd of many thousands gathered to cheer the returning soldiers; Broadway cable cars were used by the public as reviewing stands, until it seemed they would topple over on the weighted side. A man, somewhat anxious to get downtown, dropped into the first car of the blockade, and, having no chance to see the parade, took a seat on the opposite unoccupied part of the car. Presently the procession had passed, the car started up, those who had used it for a reviewing stand (free) got off, and several thousands attempted to get on. A progressive American public could only be satisfied with the first car. A half minute would be unnecessarily lost by waiting for the next car. The car being filled to its extreme capacity, a lady boarded it and succeeded in forcing her way to the center of the car, carrying innumerable parcels and an umbrella. Handing her umbrella to a passenger, seated, she said: "Kindly hold my parcel while I get my fare. They don't deserve it, though I suppose I must pay it." Why didn't the company deserve it? It is suggestive of the illogical "No seat, no fare" bill, as applying to a street railway engaged in carrying an American public. It was in a boarding house where the idiot it must have been John Kendrick Bangs' idiot, it could not have been any other—got his innings. A fellow boarder having been compelled to stand a few blocks in a crowded car—because all of the city at that time wanted to travel in the same direction as he did, and the crowd was so large that a



continuous circuit of cars could not have accommodated it—commended the municipal legislature upon its serious consideration of the "No seat, no fare" bill, advancing the old arguments of London and Paris ordinances. The arguments of his fellow boarders, that the geographical condition of those cities are different from his, and that the greater traveling is done in cheap cabs, were of no avail. It was then that the idiot, Bless him! enquired if there was a vacant seat in the car which the indignant one had boarded, and, being answered no, that it was crowded, calmly asked if the legislature would be justified in making it a misdemeanor for a person to attempt to board a car already filled to seating capacity, or if that would be an imposition upon the rights of American citizenship, and quietly left the dining-room.

In New York city, the Metropolitan Street Railway Company started, in the spring of 1897, to change the motive power on Sixth and Eighth avenues, necessitating the expenditure of several millions of dollars. The shop-keepers, along these avenues, were in a state of ecstacy. When, however, injunctions piled in, and litigations over the ownership of the franchises were begun, it was thought expedient, out of deference to the court, to stop these operations; and the shop owners were wrathfully indignant. What was the expenditure of a few million of dollars by a railroad company, or an injunction of a court, to them? This present summer the injunctions having been dissolved and the litigations decided, the railway company began to push the construction as rapidly as possible, and, for that purpose, stopped the operation of the horse cars on those streets, for a few weeks in the mid-summer. Again the shop-keepers' indignation was masterly. The erroneous popular impression, that the stopping of a car forfeited the franchise of the road, was paramount in their minds, but only for the purpose of using it as a hammer to compel the company to operate its cars. Their conduct reminds one of the county supervisors in one of the interior counties of the state, who had determined to rebuild the county jail. Resolutions were adopted something in this order:

"Resolved, that the county jail be rebuilt;

"Resolved, that the stone in the present jail be used in the construction of the new jail;

"Resolved, that the present jail be not demolished until the new jail is completed."

Such illustrations give an insight into the minds of the public, and the little things with which the railroad executives have to contend; and convey, to some extent, an idea of the construction of the great minds of the mass of the complaining and unappreciative public.

The department that has to contend most closely with the public, and whose task is infinitely great and responsible, especially in large cities, is the legal department. The convincing of juries of right and justice, overcoming of prejudices, allaying of sympathies, and destruction of perjured testimony, is a task of enormous difficulties. It would take too long to speak, in detail, of these matters; they constitute a volume in themselves. But how truly representative of the public is a jury, susceptible to all of nature's influences, emotional and often revengeful. The purchase of supplies for the company is regulated by the well-nigh stable laws of supply and demand. The market is an open one. The purchasing agent knows the market value of all his needs; the officer knows where cars and equipments are to be had, and their exact cost; the construction is most accurately approximated. But where is the limit of the award of the jury in damage cases? Has not that representative of the public the vitals of the railway company within its grasp? No one can approximate, or prophecy, the outcome of a jury trial. Few know the difficulties attending the preparation and trial of the defendant's case; the discovery of fraud; the defeat of so-called "fake" cases. At the present time the business of the class of so-called lawyers, who relentlessly pursue an injured person and beg and implore him to bring suit, and often buy the claim outright, is far in excess of that of any other class of "shark practitioners." Often, in New York city, an injured person, in an hour after the injury, will have the cards of 30 different lawyers in his possession, and the representatives of half that number will have personally interviewed him. In some instances,

as many as five suits against the company have been brought by different attorneys for the same injury. In the hands of most of these lawyers, the simple fact that an accident has happened is sufficient for them to build a "jury case," and then it depends upon the fairness and integrity of the jury to see that justice is done.

It will be seen, therefore, that the street railways support and nourish a large class of the community, consisting of these accident, or ambulance, lawyers and their staff of chasers and assistants, and is deserving of some, negative perhaps, commendation therefor. In passing, the suggestion is offered that in many instances a street railway corporation fulfills the function of an eleemosynary institution, for no juries ever know how many cases are settled, and no one knows, but the alleged injured party himself, how often peace has been bought of a fraudulent claimant for a small sum. And although the street railway company and the weather are the two things of which everyone feels entitled to complain, the majority of the public seem to be appreciative of the efforts of the companies to fulfill their obligations and promote the convenience of the people, and often a citizen is said to be suffering in silence when a cable has broken down and he is delayed half an hour, because he has patiently endured, with the company, the annoyance of an accident that might have befallen him in his own carriage, instead of demanding transfers, the Alladin-like appearance of another fully equipped car and road, having himself arrested, and bringing several suits against the company "in the interest of the public," as one poor deluded man has already done to a New York company.

The public, in spite of all, is appreciative; and let us consider for a moment what it appreciates. Improved and rapid transportation is now acclaimed throughout the land; villages that were miles apart and dependent upon the one or two steam railroad trains a day for their commercial intercourse, are brought in close contact because of the continual service of the trolley; the property en route is vastly enhanced in value; it is brought within easy approach, and loses its isolated character. In cities, the extensions to the suburbs gives the mass of the people better homes, purer air, easier, cheaper and quicker transportation, building up and populating of the outlying suburbs, and lightening the dense population in the tenement districts; besides giving employment to thousands of persons. It is essentially an institution of service to the great poorer classes, affording them cheap and rapid transportation, healthy, pleasant and accessible homes, and in the heated term, the only means of beneficial and cool outing.

For the benefit of those who often raise their voices for a 3-cent fare, let it be said that in New York city the extensive transfer system now in existence reduces the individual fare to 3 cents, and when an inspection of the vast machinery, extensive power houses and underground construction is made, and the continual repairs, endless rolling stock and great army of employes is considered, is it not a minimum fare for the benefits extended?

This paper is not intended to be instructive. If the president had asked for an instructive paper this would not have been heard. Lawyers seldom can instruct; the best they can do is untangle knots, and oftentimes it needs the assistance of three courts to accomplish that, and seldom to the satisfaction of any of the parties interested.

The relation of the public with the street railway company must be reciprocal, and is and has been growing so friendly and so closely allied as to cause some fear for the future. The time may come when the public will ride on free passes, when the people will not be injured, when the word accident will be obsolete, when the supplies, provisions and motive power will be furnished by some public spirited citizens, and the capital of these enormous enterprises be the gift of some of our millionaire philanthropists. Surely the millennium will then be at hand.

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The Consolidated Street Railway Company, of Grand Rapids, Mich., has an ironclad rule against its employes joining a union. Recently it discovered that this rule had been ignored by many, and acted promptly; 23 heads dropped into the basket on September 26.

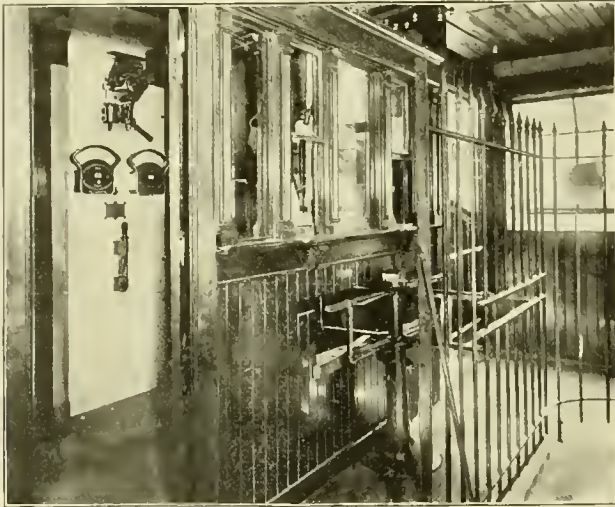
## STORAGE BATTERY OPERATION ON THE SOUTH SIDE ELEVATED.

The system of the South Side Elevated Railroad Company, of Chicago, has been successfully operated by electricity during the past six months, and the change from steam locomotives to electric traction has not only reduced operating expenses to a much lower percentage of receipts, but has so increased the traffic that the company is again on a dividend paying basis. During September the average daily traffic was 46,576, an increase of 50 per cent over the same month last year, this being due to the opening of the Union Loop and the adoption of electricity.

The Sprague multi-unit system was adopted, which involved the alteration of the entire equipment of rolling stock. It was

taxed. This is shown from curves and readings taken since the battery was put in service, and the maximum output has not exceeded 5,700 amperes. Each battery has a capacity of 535 k. w. hours at a one hour discharge rate. The battery will discharge 60 per cent above normal rating with perfect safety. They are placed in multiple with the line and their operation is entirely automatic at all times. Each one acts both as a reservoir for energy and a regulator for voltage. The batteries practically increase the capacity 25 per cent and dispense with one unit at the power house.

The cells are of the well known "chloride" type, made by the Electric Storage Battery Company, of Philadelphia. The "G" cells are used with 26 pairs of plates. The lead lined tanks have been built for twice that number of plates so that the capacity

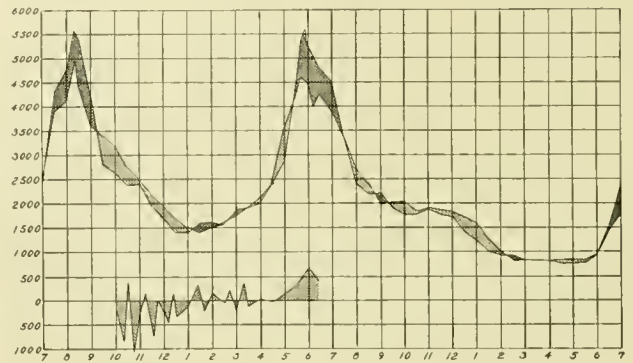


BATTERY SWITCHBOARD AT TWELFTH STREET.

found that the high rate of acceleration was attained only by a great consumption of current. During busy hours the power station was taxed to its full capacity, especially by momentary fluctuations of load. As the traffic increased it became necessary to provide for a greater source of current. The conditions were thoroughly canvassed, and it was decided that two storage battery installations would prove most satisfactory, although there was room available in the station for additional engines and boilers.

The current for the lines is supplied from four 80 k. w. Westinghouse generators. As may be seen from the curves, the current demand at times reaches 7,800 amperes, this being an overload of 50 per cent on the station. By reference to the feeder diagram it will be seen that the power station is practically in the center of gravity of the system. At Sixty-first street are the yards and shops of the company, and here, beneath the structure, a room was set apart for one battery, this being 16,018 ft. south of the station power house. The last passenger station north, before entering the business district, is at Twelfth street, and here a room was arranged for the other battery, (this being 16,600 ft. from the power house. These battery stations require very little attention, and the simplicity of the switchboards may be seen from the two illustrations, one of which is in the train dispatcher's office at Sixty-first street, and the other is in the ticket office at Twelfth street. Weston instruments are mounted on each board. The interior views in both battery rooms are shown.

At each of these places a battery of 248 cells was installed. This arrangement was deemed better than placing the battery at the power house, as three sources of power are available for sudden demands and the voltage is maintained constant at the extremities of the line as well as near the power house. There is also a large saving in feeder capacity, as a portion of the current comes from the battery when the feeders are heavily



24-HOUR STATION LOAD CURVES SHOWING WORK OF BATTERIES.

may be doubled quickly and easily by putting in the additional plates. Each tank is 51½ in. in length, 21½ in. wide, and 24¾ in. deep. The weight of each element is 544 lbs. The discharge in amperes is 364 amperes in five hours, 520 in three hours, and 1,040 in one hour, while the nominal rate of charge is 260 amperes.

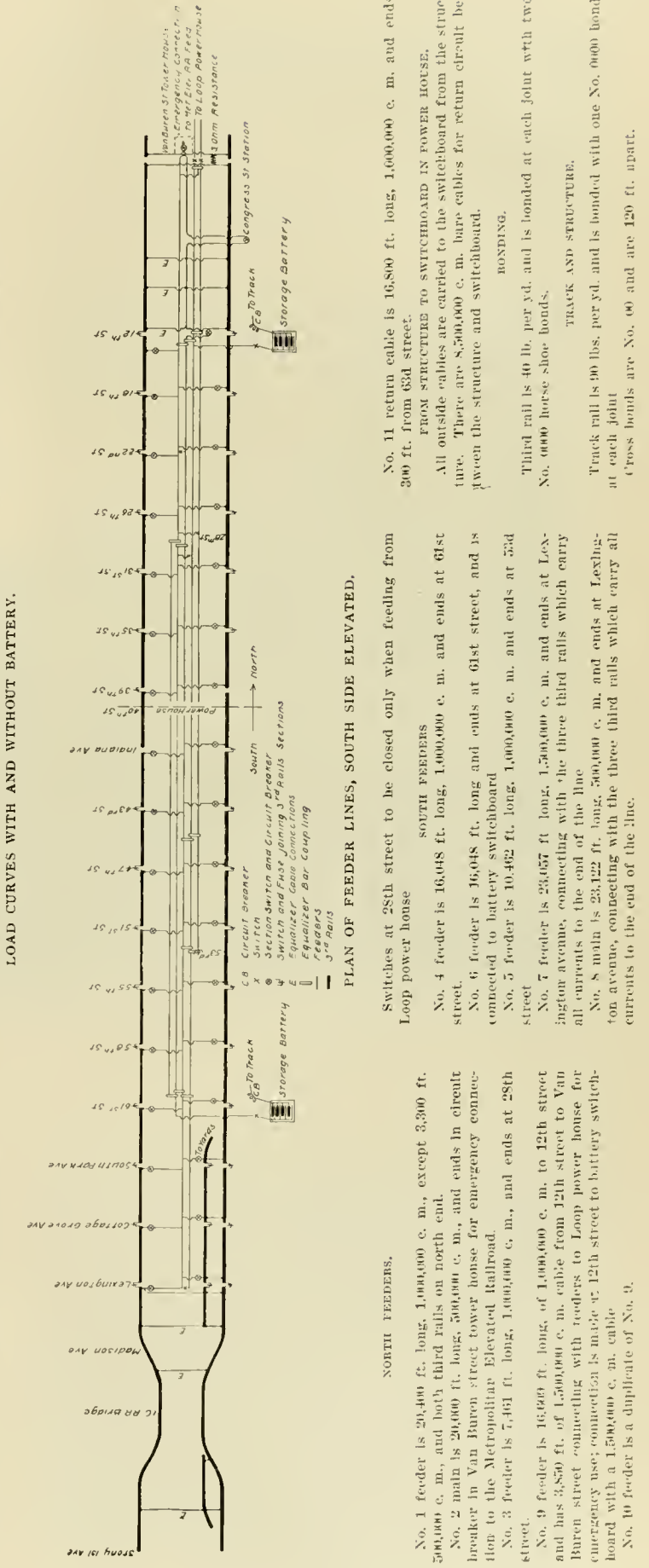
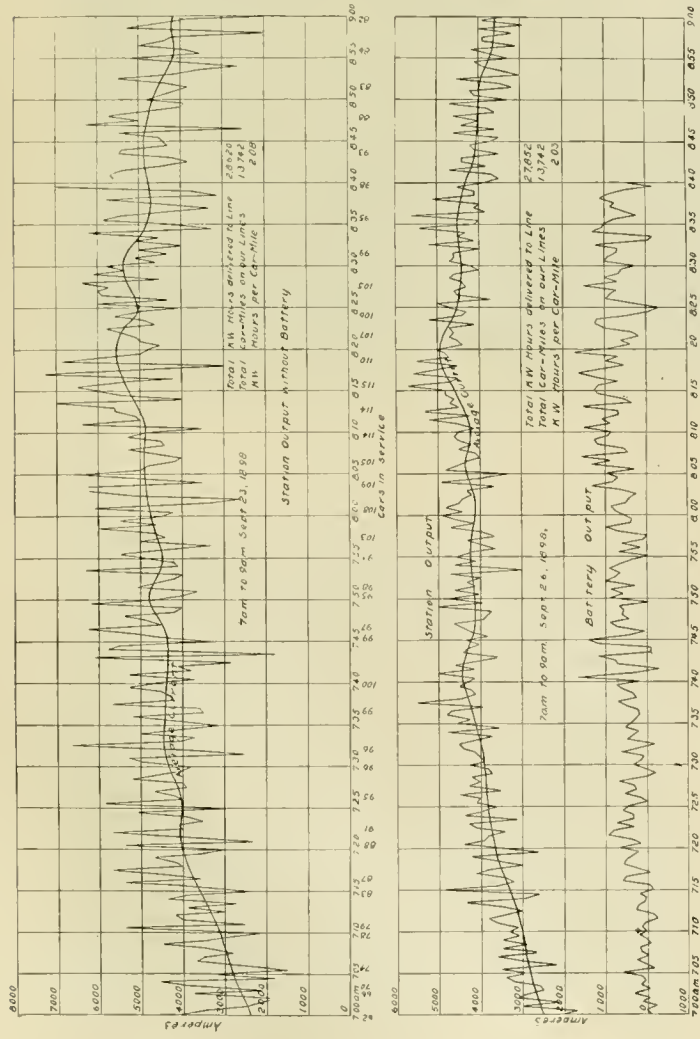
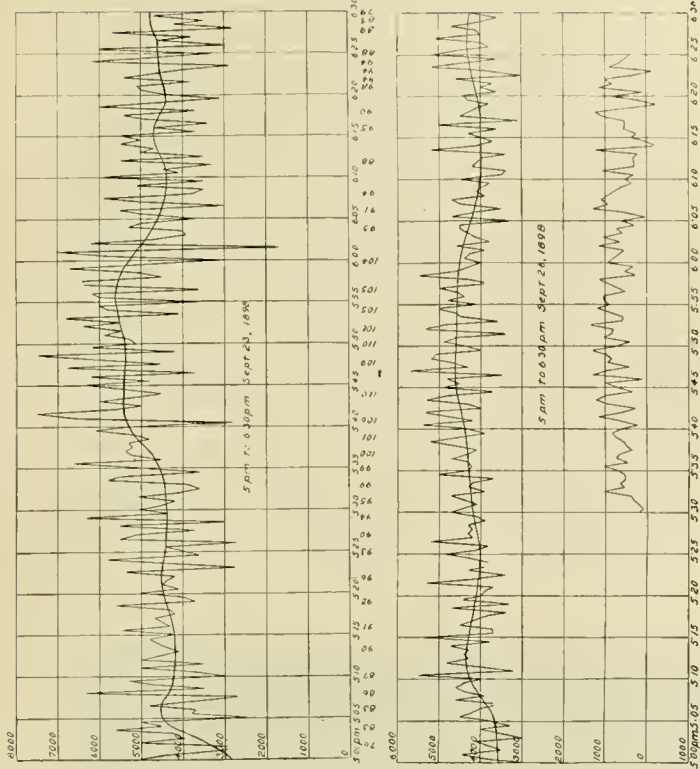
In the curves to large scale the performance of the station is shown with and without the battery during the busy morning and evening periods of two days, and in these the momentary



TRAIN DISPATCHER'S OFFICE, SIXTY-FIRST STREET.

fluctuations are recorded. In the 24-hour curves it will be noted that the peaks do not rise to such a height as in the others, only the average for each half hour being plotted. The single cross hatching represents the period in which the batteries are charging and the amount of current taken in and the double cross hatching shows the time and the proportion of the current





LOAD CURVES WITH AND WITHOUT BATTERY.

which they supply to the line. It will be seen that the battery is not of sufficient capacity to materially relieve the heavy loads during the two hours in the morning and evening. Although it cut down the average peaks at least 1,000 amperes, its principal function is to take care of the instantaneous current demands, thus preventing the circuit breakers from going out and causing aggravating delays.

The effect of the battery giving a steadier load to the station is manifested in the steam and water consumption, which has decreased, and the slightly less watt-hour consumption per car-mile is due partly to the voltage regulation. The number of cars, as shown on the curves, is not the total number in operation, but only the number to which the station and batteries are supplying current. The cars, on passing to the tracks of the Union Loop, receive current from the Loop station. During the busy hours there are as many as 32 South Side cars on the Loop at the same time.

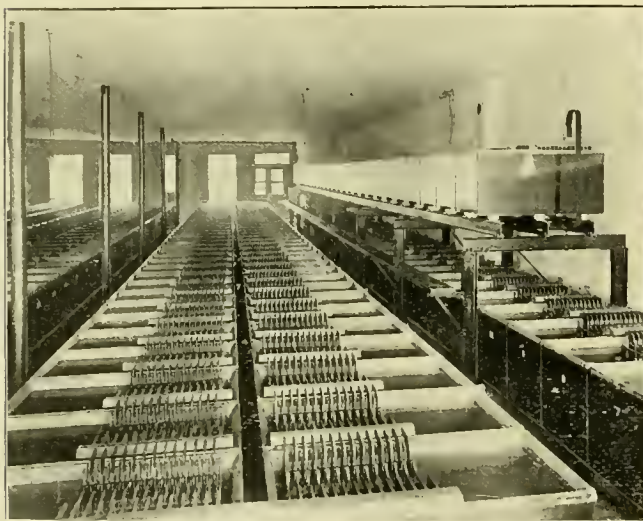
The symmetry of the day curve is rather remarkable and represents the manner in which the equipment is taxed to care for the morning and evening traffic. It also indicates the character of the patronage. The great majority of the passengers from the south side resident districts go to the downtown offices and stores about 8:30 a. m. and return at 5:30 p. m., and there is

## CREOSOTED WOOD BLOCK PAVEMENTS.

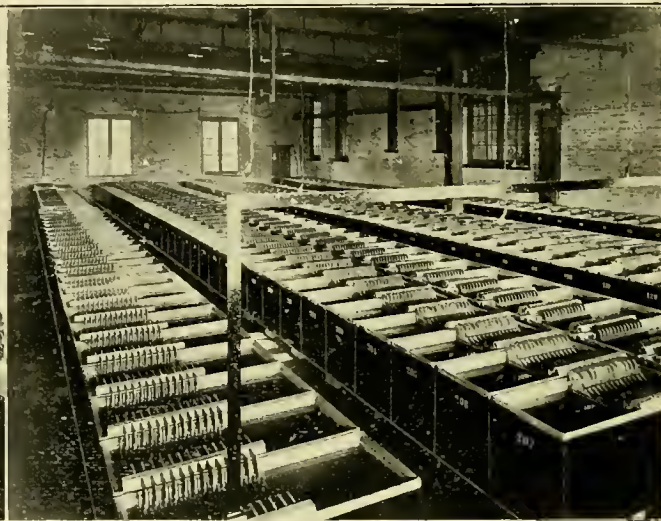
In "Municipal Engineering" for September F. A. Hetherington points out some of the defects in the creosoted wood block pavements of Indianapolis, and reaches the conclusions that (1) wood pavements are destroyed by abrasion, not rot; that (2) creosoting wood blocks does not increase their power to withstand abrasion, although it may deter rotting; that (3) no reliable method has been devised to overcome the effects of expansion in wood pavements; and that (4) blocks set in lines diagonally to the line of the street will withstand abrasion longer than those set transversely.

Clarence A. Kenyon in the same number takes issue with Mr. Hetherington on two of these points, and cites government tests of timber showing that preservatives increased the resistance to bending by 15 per cent, and to compression by 22 per cent. He also claims that expansion in wood block pavements can be taken care of in several ways. The creosoted wood block pavement at Galveston, Tex., is cited as having been a very durable one.

In the succeeding number of the magazine Mr. Hetherington quotes from a description of the Galveston pavement published in the same paper in April last as follows:



BATTERY AT TWELFTH STREET.



BATTERY AT SIXTY-FIRST STREET.

also a fairly heavy traffic from 8 to 12 at night to accommodate the theater crowds.

These batteries were put in under the direction and supervision of Sargent & Lundy, consulting engineers for the South Side Elevated Company, and both they and General Manager Hopkins are satisfied with the performance of the batteries. The order was taken by F. H. Clark, western representative of the Electric Storage Battery Company. This company has installed nearly all the storage batteries used in the street railway plants in this country. The large storage batteries of the Consolidated Traction Company, Pittsburg, the Buffalo Railway, the Richmond Railway & Electric Company and many others have been put in within a brief period. It has been proved by experience that batteries operated in connection with railway generators, which invariably are subjected to sudden and excessive current demands, reduce the cost of producing energy.

Fare boxes, the teapot kind, are in use on the Northeast road in Kansas City, and the conductors find that they secure quite a percentage of lead pieces and buttons when the cars are crowded. Recently an old gentleman contributed a \$5 gold piece and had to stay with the car until the office was reached on the return trip before he could get his money back.

"The method of paving here would not, of course, be applicable to other localities. The formation of this island is a pack sand. By flooding with water it can be packed so closely that a loaded vehicle will scarcely leave a track. After thoroughly saturating the ground, we surface the sand which forms the contour of the street, and on this grade we lay the blocks closely, as is done with brick or asphalt blocks. The interstices are filled close with clean and dry sand. The surface is rammed until the interstices are filled solidly with sand, and the surface smooth and even to conform to the contour of the street. The surface is then flooded with coal tar, liquified by heat to a sufficient degree to penetrate the sand joints, which is then followed by a second coating of paving cement, or thick mixture of asphaltum and dead oil. The surface is then covered with sharp sand and the pavement is complete. \* \* \* Our blocks are cut from yellow pine, 5 in. thick, 5 and 6 in. deep, and from 6 to 10 in. long. \* \* \* The required amount of oil (creosote) for paving blocks is twelve pounds to the cubic foot."

On this Mr. Hetherington says that it is probable that the sand base spoken of serves to conduct away the moisture which otherwise would accumulate in the blocks and produce results similar to those noted in the Indianapolis pavements (swelling and bulging up).



**COAL HANDLING MACHINERY.**

**The Causes Which Have Led to the Development of Economical Methods of Handling Coal in Power Stations—Some Notable Installations.**

In designing a power station for a street railway, or even in remodeling the old ones, an important consideration is the economic handling of fuel. Only within the last five years has this been a matter of interest to railway managers, for when the direct connected unit found its place in the station and made large power stations possible, the boiler capacity was greatly increased and the labor item in handling coal became an important one. The two largest accounts in the cost of power are fuel and labor, and the savings recently effected in these are remarkable. Not long since only the best lump coal was considered suitable for firing, but now only the cheapest grades of coal are used; even the culm heaps supply large quantities and many stations burn "run of mine" coal. This coal is delivered just as it comes from the mine, large and small lumps being mixed with slack, fire clay and slate fragments, etc. In the absence of screening the operators can afford to sell it for a fraction of what the price of sorted coal would be. But more of the low grade fuel is required and this further increases the labor bill.

The location of a station has much to do with its cost of fuel. There are many stations built 8 or 10 years ago that are connected neither by rail nor water to the fuel supply. Today such an instance is rare, the only excuse for such a location being that the interest on the cost of extra feeders is considerably in excess of the annual cost of hauling coal in wagons to the boiler room.

The two factors which made possible the extensive use of low grade coal were the successful use of the mechanical stoker and the substitution of fuel handling machinery for the barrow and the shovel. The machinery is subjected to rough usage and is generally covered with grease and coal dust. On this account it was originally roughly constructed and little care was exercised in its operation. It was constantly getting out of order, and many managers became prejudiced against it. In the later installations every part is carefully designed and all the bearings are nicely fitted. The

first cost is a large item, but the maintenance charges are much reduced, the operation is more reliable and a great saving in labor is effected.

In addition to having facilities for handling the coal it is desirable to have a place for keeping a supply on hand. A strike on the railroad or in the mines, storms, floods, etc., may cut off the supply of coal and for a short time cause a great increase in the cost of fuel. Such was the ex-



FIG. 2.—COAL HOUSE, CALIFORNIA AVENUE STATION.

perience of a number of railway companies in 1897 when there was a miners' strike; in some instances the cost of coal increased more than 50 per cent. Although it is not practical to have a storage capacity sufficient to last for a long time, it will usually bridge over trouble for a short period.

When there is an abundance of room about a power house the problem of storage is not a difficult one, for cheap coal houses can be constructed and there may be railroad sidings for storing cars. As a rule, however, stations are located on valuable ground and the coal bins must occupy little floor space. This involves much steel construction and gives an opportunity for ingenious design.

The California avenue station, which supplies current to

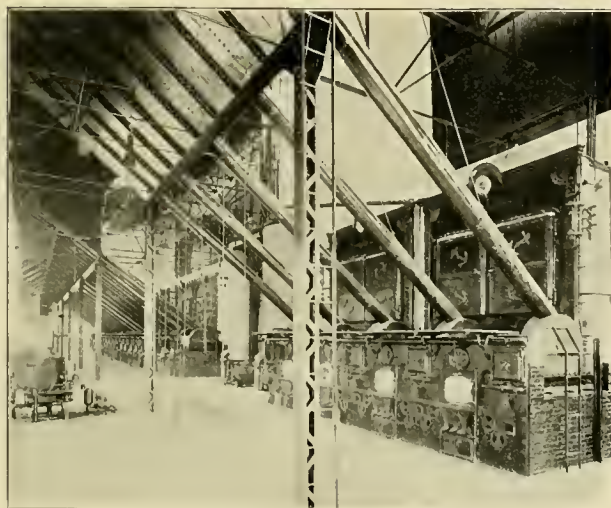


FIG. 1.—BOILER ROOM, CALIFORNIA AVENUE STATION.



FIG. 3.—REMOVING ASHES.

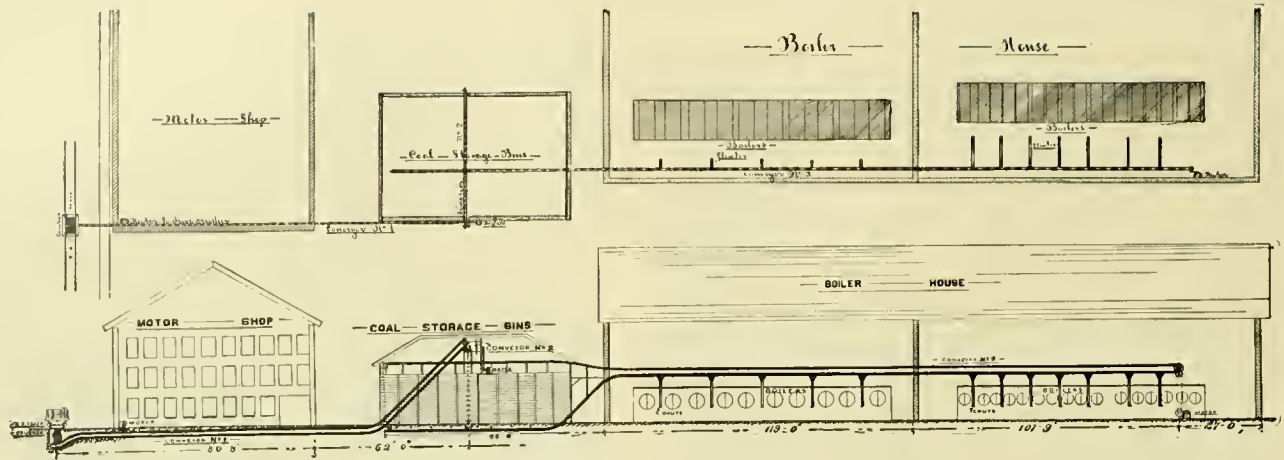


FIG. 4.—COAL HANDLING MACHINERY, TORONTO RAILWAY.

the lines of the North Chicago Street Railroad Company and the Chicago Electric Transit Company, is the only station belonging to the Yerkes system that burns coal instead of oil. In the boiler room there are 10 water tube boilers of 300 h. p. capacity each, and in front and above is a bin holding 400 tons of coal, Fig. 1. The coal storage house is apart from the power house and is 24 ft. wide by 200 ft. long. The station is located on the Chicago river, which

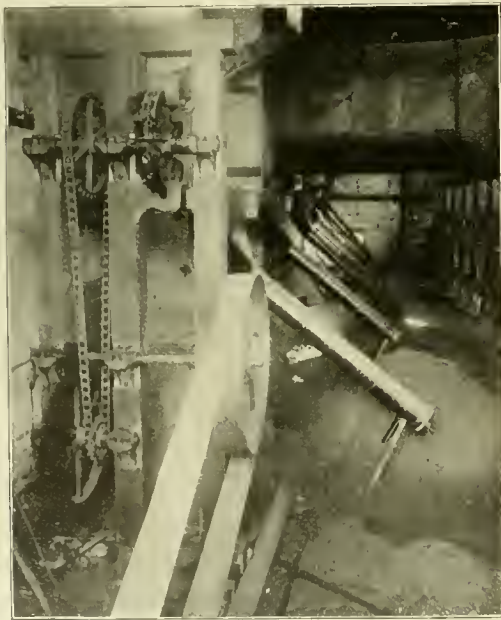


FIG. 5.—BOILER ROOM, TORONTO.

furnishes an abundant supply of condensing water, but its depth is too uncertain for shipping fuel. The coal is delivered in wagons, weighed on a platform scale between the station and coal house and the wagon is drawn on a pivoted platform, just to the left of the end of the coal house, as shown in Fig. 2. By the use of a hand wheel and gearing the coal is dumped from the wagon into a hopper, which feeds the run of mine coal to a crusher. This consists of two cast iron toothed cylinders revolving in opposite directions on parallel shafts. The coal, which is there reduced to a fairly uniform size, is either conveyed back into the coal house or is carried into the bin in the boiler room for use. The coal is fed from the bin to the stokers through chutes

by opening slide doors operated by iron rods extending down to within a few feet of the floor. The coal house has a capacity of 4,000 tons.

A conveyor collects the ashes from beneath the boilers and deposits them in a bin outside the building. In Fig. 3 is shown a dinkey locomotive with ash car beneath the bin. The ashes are hauled out in the station yard and dumped in piles. They are sold for a nominal sum per cu. yd., and purchasers are plentiful. The shafting and gearing for the conveyors are driven by a 40-h. p., 550-volt motor. Harrison conveyors, made by the Borden & Selleck Company, of Chicago, are used both for the coal and ashes.

The coal handling plant of the Toronto Railway Company is arranged to receive the fuel from the cars, store and convey it to the boiler room with small expenditure of time, labor or money. It was arranged and built by the Borden & Selleck Company in 1895. As may be seen in the plan and section of the power plant, Fig. 4, the railroad runs along one end of the buildings and coal cars with hopper bottoms can deposit the coal into the crusher hopper, under the track. The crusher is motor driven and has a capacity of 40 tons per hour. No lumps of coal exceeding 3 in. can pass between the rolls. The coal then passes into conveyor No. 1, is carried under the shop and up an incline, where it is either discharged into conveyor No. 2 for distribution in the storage bins or into conveyor No. 3 to be carried into the boiler room.



FIG. 6.—DINKEY LOCOMOTIVE, CHICAGO CITY RAILWAY.



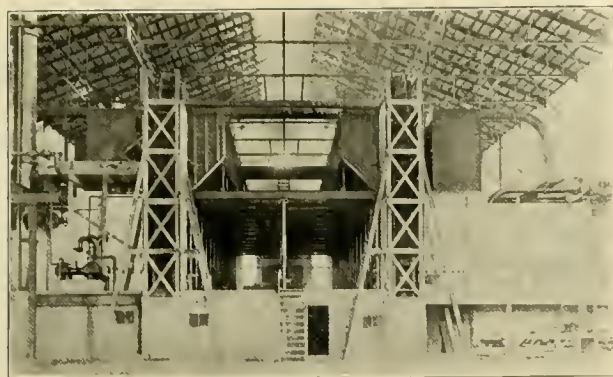


FIG. 7.—END VIEW OF BOILER ROOM.

The driving mechanism with conveyor and spouts in the boiler room is shown in Fig. 5. All the spout valves are operated from the boiler room floor. The plant can be operated by one man, which reduces the cost of storing and getting the coal to the boilers to a minimum.

The new power house of the Chicago City Railway Company at 49th street and Oakley avenue is equipped with coal and ash handling machinery which is easily capable of moving the vast quantities of fuel needed when that station is running at its full capacity. The fuel is the slack from coal screenings and is brought from the mines near Terre Haute, Ind. Merely a nominal price is paid for this slack, and with facilities for handling and firing it proves a very cheap fuel. It is delivered in lots of several carloads and switched into the yards of the station, in which there is ample room for 40 cars.

When there is need of the coal the dinky locomotive, shown in Fig. 6, pushes the car on the switch between the boiler room and the base of the smoke stack and just above the coal hopper. If an ordinary car the coal has to be shoveled into the hopper, but in the future coal dump cars will be employed exclusively. The dinky weighs about 10 tons and is capable of drawing a loaded car of 100,000 lbs. up a 1 per cent grade. It was made in the repair shops of the company. To the left in the picture is the ash car, which is beneath the ash bin.

Fig. 7 is from an end view in the boiler room showing the arrangement of the boilers, the coal bin and the con-

veyors. The McCaslin conveyor, made by the John A. Mead Company, of Rutland, Vt., is employed. The conveyor buckets, track, driving and tipping mechanism are all plainly shown in Fig. 8. Each conveyor is driven by a 15-h. p. engine, which is on a platform below and belted to the shafting and gears, as shown. After the coal passes from the hopper outside the boiler room it is carried to the desired points, where the buckets are dumped into the coal bin, which holds 800 tons. Each conveyor has an ultimate capacity of 60 tons per hour.

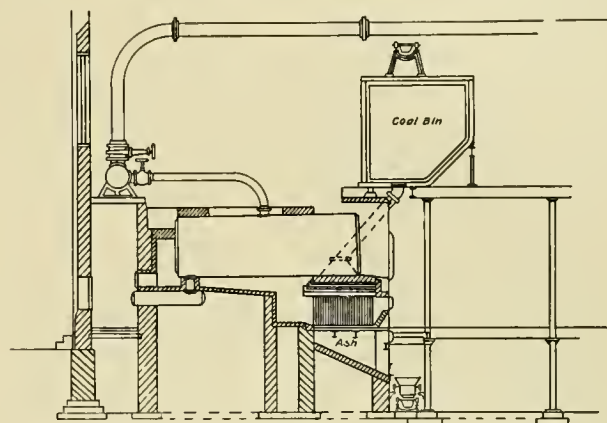


FIG. 9.—SECTION SHOWING ASH PIT.

Beneath each boiler is an ash pit with the floor slanting towards the front at a sharp angle, as may be seen in Fig. 9. In front of the ash pits and above the conveyor buckets is a track upon which runs an ash hopper. When the ashes are to be removed the hopper car is run to the ash pit and the iron door to the pit lifted and the ashes pass through the hopper into the buckets and are carried to the ash bin.

With this machinery and the mechanical stokers very little labor is required in the boiler room. The cost of handling the fuel from the time it enters the yard to the time it goes out in the form of ashes is 16 cents per ton. It has been estimated by the railway engineers that the saving effected by the installation of this machinery pays yearly 20 per cent on the investment.

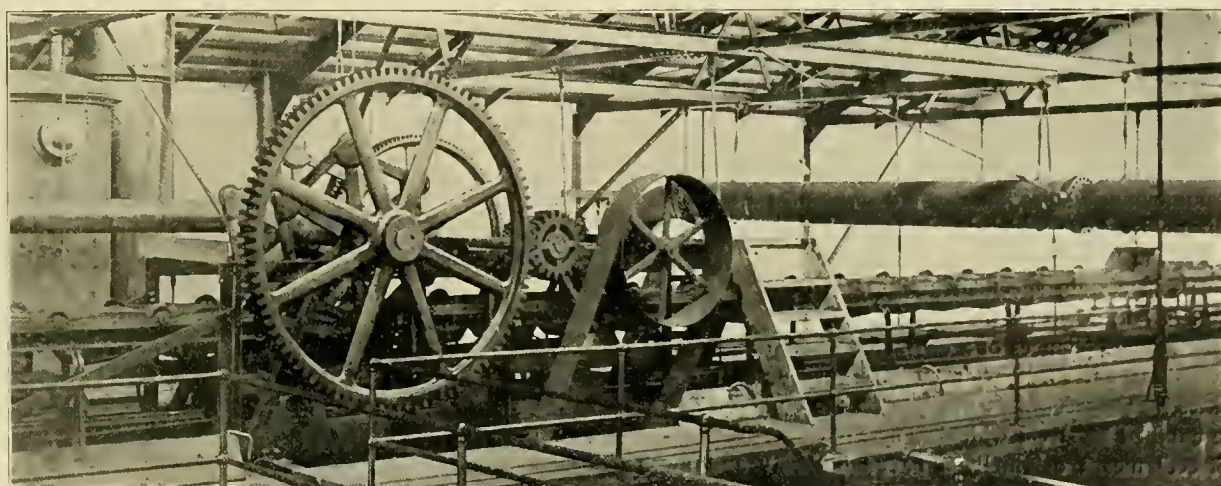


FIG. 8.—DRIVING MECHANISM, COAL HANDLING MACHINERY, CHICAGO CITY RAILWAY.

## ELECTRIC RAILWAYS IN COUNTRY HIGHWAYS.

They Make a Use of the Highway Similar to the Use of a Street by a Street Railway—The Proportion of the Traffic Which Is Local—Save in Exceptional Cases They Do Not Carry Passengers Who Would Otherwise Go by the Steam Railroad, but Have Developed and Satisfy a New Demand.

At the present time the cities of the United States are well supplied with street railways; there are of course new lines laid and extensions built each year but these are for the purpose of giving transportation facilities to the residents of the more recently settled (so to speak) districts of the city, and the additional lines extend into a new field; the old field was well covered. In large cities the most recently built transportation lines have been constructed with the object of giving a more rapid service than is possible with street surface cars. In nearly all of the smaller towns which are able to properly support a street railway there is one to be found, and unfortunately this is true of many towns that are not able to support the enterprise.

The strictly urban field is occupied and the greater number of electric railways recently built, and the vast majority of those now contemplated, are interurban lines. They have been made possible by the development of electricity as a motive power, and consequently constitute a new means of transportation between towns. The use of this motive power under new conditions has naturally raised important legal questions, and because the interurban railway has developed simultaneously in many different jurisdictions there has been opportunity for the courts to rule differently regarding the status of such a railway, that would not have occurred had the growth of the industry been more gradual as was the case with the urban street railway. A very important question is whether an interurban electric railway is to be considered as an additional burden on the fee of abutting property.

In discussing whether it should be properly so considered we may examine some definitions of a "street railway." In the first section of "Booth on Street Railways" it is said:

"Street railways are those which are constructed in streets, whether on, below or above the surface, along and over which cars are propelled by animal or other power on fixed tracks as common carriers of passengers for the convenience and accommodation of the people living upon or near such highways, and to facilitate the transportation of passengers thereon. A distinctive and essential feature of a street railway, in relation to other railroads, is that it is exclusively for the transportation of passengers and not of goods."

Charles Francis Adams, chairman of the Massachusetts committee which investigated the relations of street railways and municipalities, propounded a definition of a street railway franchise from which it is gathered that a street railway has the "exclusive right to run for money improved carriages in certain specified public streets, over a special pavement, laid down for that special use, using therefor peculiar motive appliances of a character which others cannot use, entailing extraordinary pecuniary burdens on the communities." The pecuniary burdens on the communities are those entailed by street widening and paving.

"Street" meant originally a paved highway and in the accepted meaning of the term implies also the presence of houses, shops, or other buildings abutting upon it, and

therefore it is generally confined to the highways of cities. The purposes the highway is intended to serve are the same whether it is a street or a country road; it is to afford access to the abutting property, and is for the use of the public in either case. In all save a few exceptional cases the land for the highway is furnished by the owners of the abutting property and they bear the expense of the original road making, the city, township or county attending to the repairs.

The name "street railway" is applied to the railways which are laid in highways to facilitate the use of them for the purpose of travel merely because such railways were first laid in "streets" and provided the use remains the same there is every reason why an interurban railway should be considered a street railway even if it is laid in a country road.

It is a well settled doctrine that street railways constitute no additional burden on the abutting property, even if the motive power be electricity, within the limits of cities and towns. Several states have extended this rule to railways in country highways, otherwise known as interurban roads; among them being Connecticut, Ohio and Indiana.

As to the rulings in Ohio, Thomas F. Walsh, president of the Akron & Cuyahoga Falls Rapid Transit Company, advises us as follows:

"We have had the question passed upon in two cases in which we were interested ourselves, and in similar cases the same question has been passed upon by both our common pleas and circuit courts, they holding, and very properly, that there was no ground of recovery except in cases where, by reason of the construction of the road, the owner of the abutting property suffered some special damage or injury. That is where, by reason of cutting or filling, his ingress or egress would be impaired. The courts hold that the mere construction of a street railroad in country roads where the level conformed to the grade of the road, even where it was constructed on the side of the road, was neither the taking of property or property rights nor the adding any additional burdens thereto. This seems to have been the rule that has been followed in this state for all time. Our courts hold street railroads as an improved mode of travel and their judgment is based upon that principle, and they only permit abutting owners to recover where they are obliged to suffer a special injury by reason of the construction of the road."

So far as we know Wisconsin is the only state where a distinction has been drawn between the street and the country road; the supreme court rendered its decision in the case of Zehren against the Milwaukee Electric Railway & Light Company in March, 1898 (74 N. W., 538), and an abstract was published in the REVIEW for May. In this case the court bases its ruling on the different character of the use of the highway in the case of an interurban railway, and takes premises which we believe to be unwarranted in the light of the experience of such railways.

It is there pointed out that:

The street railway in its inception is a purely urban institution. It is intended to facilitate travel in and about the city,



from one part of the municipality to another, and thus relieve the sidewalks of foot passengers and the roadways of vehicles. It is thus an aid to the exercise of the easement or right of passage; strictly, a city convenience, for use in the city, by people living or stopping therein, and fully under the control of municipal authorities, who have been endowed with ample power for that purpose.

This strictly urban character of the street railways remained practically unchanged for many years, and during these years the long line of decisions grew up recognizing the street railway as merely an improved method of using the street, and rather as a help to the street than as a burden thereon.

After reciting the change in motive power it is said:

Thus, the urban railway has developed into the interurban railway, and threatens soon to develop into the interstate railway. The small car which took up passengers at one corner, and dropped them at another, has become a large coach, approximating the ordinary railway coach in size, and has become a part, perhaps, of a train which sweeps across the country from one city to another, bearing its load of passengers ticketed through, with an occasional passenger picked up on the highway. The purely city purpose which the urban railway subserved has developed into or been supplanted by an entirely different purpose, namely, the transportation of passengers from city to city over long stretches of intervening country.

When this train or car, with its load of through passengers, is passing through a country town, it is clearly serving no township purpose, save in the most limited sense. This through travel is unquestionably composed of people who otherwise would travel on the ordinary steam railway, and would not use the highway at all. Thus, the operation of this newly-developed street railway (so-called) upon the country road is precisely opposite to the operation of the urban railway upon the city street. It burdens the road with travel which would otherwise not be there, instead of relieving it by the substitution of one vehicle for many.

It is the foregoing assumption that the great proportion of the passengers on interurban electric lines are "ticketed through" to which we take exception, for if in point of fact the interurban cars stop at short intervals, taking up and putting down passengers at whatever points they designate we fail to see the distinction between the use of the highway in the two cases.

We have made inquiries of the managers of interurban electric railways with a view to securing data as to the percentage of "through traffic" on their several lines. Some have been unable to furnish the information desired because they have kept no records of the number of passengers with reference to their destination, and could only make estimates; in some instances the manager has had special records kept for a short period to secure the data asked.

The map shows the interurban and suburban lines of the

Birmingham (Ala.) Railway & Electric Company with the stations indicated. J. B. McClary, the general manager, says in answer to the question of what portion of the total are through passengers: "We do not keep a correct record of the through and local fares but I am safe in saying that 60 per cent of our suburban business is local. Our suburban lines make as many stops as our urban lines."

A. A. Anderson, general manager of the Mahoning Valley Railway Company, Youngstown, O., writes:

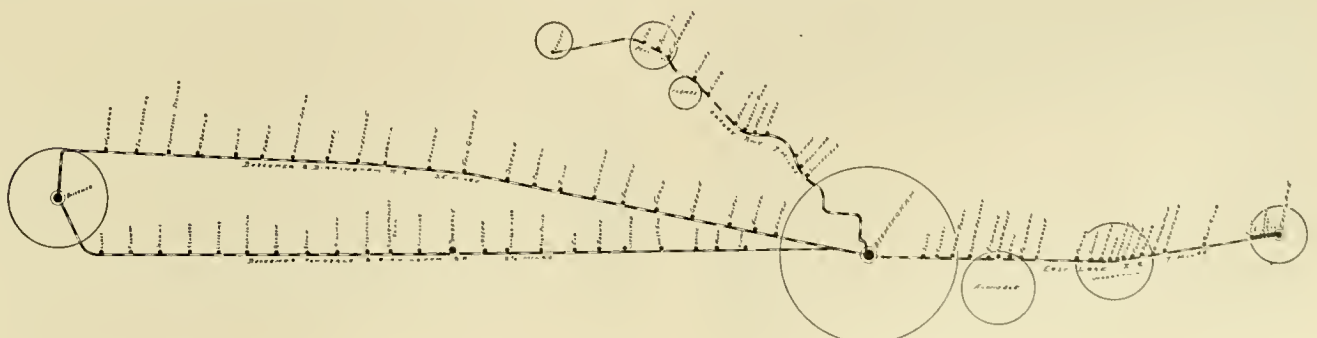
"In my judgment our road from Youngstown to Niles and on to Warren, could hardly be looked upon as an additional burden to the highway, even outside of the corporate limits of the villages and towns through which it is operated. A few of the cars operated over the line are a little larger than those used in our city service, and at one or two places a higher speed is attained. Through fares are not collected on our line, only from one limit to another, and fares from through passengers are collected several times on the through trip.

"In our city service cars stop to take on and let off passengers at street intersections only. Outside of corporate limits we have 'Stop' signs painted on our poles, and people living along the line can get on or off the cars directly in front of their homes. There is no distance greater between stops than 1,000 to 1,200 ft. I have not the figures at hand to show what percentage is local, but in my judgment not over 25 per cent of the travel on our interurban line could be termed through travel. It is a fact, of course, that our road has drawn largely on the traffic of the three competing steam railroad lines, but, for the reason that people can get on and off of our cars very close to the points to which they wish to go, in most instances directly in front of the places to which they wish to go, whereas traveling on the steam railroads heretofore it was necessary for them to go to the railroad depots and walk to and from the ultimate destinations.

"In my judgment, not over 15 per cent of the patronage of our interurban line is the class that formerly patronized the steam railroads. Our road has created a new coming and going, and has not had to depend for its business upon the traffic formerly handled by the steam railroads."

The McKeesport, Wilmerding & Duquesne Railway Company had a special count kept for two days, and Superintendent Etheridge advises us of the result as follows:

On April 29, there were 168 through passengers and 819 local passengers, or "pick-ups," between the termini, which are 8.15 miles apart.



LINES OF THE BIRMINGHAM (ALA.) RAILWAY & ELECTRIC COMPANY.

On April 30, there were 288 through and 1,746 "pick-ups."

The percentage of through passengers was:

April 29 .....	17.0 per cent.
April 30 .....	14.1 per cent.
For the two days.....	15.1 per cent.

Burt Van Horn, general manager of the Buffalo & Niagara Falls Electric Railway, furnishes the following statement showing the number of passengers carried between the different points along the line of that road and the distances between the several stations, which are also stations of the steam roads. Mr. Van Horn states: "It is very difficult, and indeed impossible, to arrive at the number of passengers carried from points along the line which are located between the places named. The same fare is charged from any point in a township to any point in any other township along the line."

Between.	Passengers.	Per Cent of Total.	Distance.
Buffalo and Tonawanda.....	185,303	19.1	5 mi. from Buffalo limits to N. Tonawanda limits.
Buffalo and North Tonawanda.....	101,968	10.5	9 mi. from Buffalo limits to most distant point.
Buffalo and La Salle.....	18,527	1.9	15 mi. from Buffalo limits to most distant point.
Buffalo and Niagara Falls. Tonawanda and Niagara Falls.....	412,487	42.4	18.5 mi. from Buffalo limits to most distant point.
North Tonawanda and Niagara Falls.....	7,112	.7	13.5 mi.
North Tonawanda and La Salle.....	56,061	6.0	9.5 mi.
LaSalle and Niagara Falls.	16,468	1.7	6 mi.
Tonawanda and North Tonawanda.....	72,236	7.4	3.5 mi.
Tonawanda and North Tonawanda.....	99,361	10.3	Adjacent.
<b>Total.....</b>	<b>970,023</b>	<b>100.0</b>	

It will be remarked that here but 42.4 per cent are ticketed through, though the point of greatest interest for tourists in the country is one terminus.

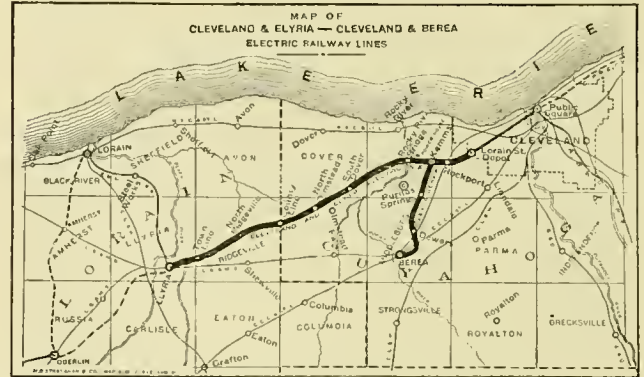
W. J. Hield, general manager of the Twin City Rapid Transit Company, Minneapolis and St. Paul, writes as follows:—"On our interurban line we have checked the percentages of through and local traffic and find them very nearly even. Our business during the holiday season showed that a large proportion of the travel was local but at other periods of the year, rather more than 50 per cent has been through travel. On the whole, I think it is pretty nearly an even thing, and as a matter of fact we have several times figured schedules on a basis of operating through cars, that is, those which did not stop at intermediate points, and local cars which make all stops, and these schedules have been made up on a basis of operating through and local cars alternately."

G. A. Hart, general manager of the Manistee (Mich.), Filer City & Eastlake Railway, writes: "Our road accommodates the people around Manistee Lake in Stronach, Filer City, Oak Hill, Manistee, Parkdale and Eastlake but I do not think we carry 10 through passengers any day except Sundays or on pleasant evenings when people go over

the line for a pleasure trip. The majority of our passengers are local, but we have no exact figures. The line is built up the whole length of it and is an accommodation to the property owners along it."

We are advised that on the lines of the Scranton (Pa.) Railway Company, the through travel is very much less than the local though exact data are not available.

F. T. Pomeroy, general manager of the Cleveland, Berea, Elyria & Oberlin Railway, sends us the statement of traffic on this line for the year 1897 which is exhibited in the ac-



companying tables. The map shows the routes and stations. Lorain street depot is at the city limits of Cleveland and is the beginning of the line, but cars run through to the public square, Cleveland, over the Cleveland City Railway

BEREA DIVISION—TOTAL PASSENGERS FOR 1897.

From	To						Total.
	Lorain St. Depot.	Rockport Station.	Kamm's.	Puritas Springs.	Dewars.	Berea.	
Lorain St. Depot.....	.....	20468	7965	14218	5584	217	100210
Rockport Station.....	17349	.....	423	3152	484	2135	23543
Kamm's.....	6104	422	.....	476	131	1266	8462
Puritas Springs.....	15755	2796	327	.....	1419	4938	25235
Dewars.....	5892	553	155	1740	.....	4403	12743
Berea.....	217	52093	1986	1513	5012	6083	66687
<b>Total.....</b>	<b>97470</b>	<b>26225</b>	<b>10383</b>	<b>24598</b>	<b>13701</b>	<b>64533</b>	<b>236930</b>

ELYRIA DIVISION—TOTAL PASSENGERS FOR 1897.

From	To								Total.		
	Lorain St. Depot.	Rockport Station.	Kamm's.	Rocky River Bridge.	South Dover.	North Olmsted.	County Line.	Ridgeville.		Town Line.	Elyria.
Lorain St. Depot.....	13936	1357	8171	10140	9287	3518	5835	1301	5514	108990	
Rockport Station.....	7655	111	7	321	295	217	128	10	584	9598	
Kamm's.....	1555	51	.....	46	45	30	30	4	332	2101	
Rocky River Bridge.....	5150	401	26	.....	2737	1183	429	412	8	856	
South Dover.....	8590	371	80	2248	.....	1552	684	284	8	553	
North Olmsted.....	7510	152	44	639	1342	.....	1460	845	76	1916	
County Line.....	2826	149	40	251	957	1438	.....	1271	132	2539	
Ridgeville.....	5077	182	44	256	202	842	1295	.....	1145	17520	
Town Line.....	958	25	8	24	13	90	138	1072	.....	8000	
Elyria.....	57770	903	520	1356	1016	3232	3830	21800	14685	105208	
<b>Total.....</b>	<b>97121</b>	<b>16170</b>	<b>2236</b>	<b>13230</b>	<b>16474</b>	<b>17964</b>	<b>11607</b>	<b>31767</b>	<b>17403</b>	<b>87754</b>	<b>311326</b>



Company's tracks. The stations on the Elyria line are about  $2\frac{1}{2}$  miles apart, except Rockport Station and Kamms and Rocky River Bridge; this division is from Rockport Station to Rocky River Bridge. On the Berea line the distance is about  $2\frac{1}{2}$  miles except from Rockport Station to Kamms and from Kamms to Puritas Springs; this division is from Rockport Station to Puritas Springs. The station Kamms is on the reports because it is the junction of the two roads.

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From these statements it appears that on the Elyria line 36 per cent of the passengers are "ticketed through," and on the Berea line 44 per cent are "through."

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On the lines of the Hartford, Manchester & Rockville Tramway Company, South Manchester, Conn., we are informed that probably 75 per cent of the business is "through," but there are no accurate data.

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The Inter-Urban Railway Company, Saginaw, Mich., advises us that during the year from February 1, 1897, to February 1, 1898, the through traffic was 55 per cent of the total, and the local 45 per cent of the total. The local traffic is gathered from four different points whose distances from Saginaw are about  $1\frac{1}{2}$ ,  $2\frac{1}{2}$ , 5 and 9 miles, respectively. The first three points have the same fare and these are grouped in one amount which shows the travel from these points collectively to be 41 per cent of the entire, and the travel from the last or fourth point is 4 per cent of the entire travel.

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A count for three days on the Canton-Massillon Electric Railway, kindly made for us by the general manager, H. C. Fogle, showed that

1444	passengers	went from one terminus to the other.
325	"	left the cars in the country.
203	"	took the cars in the country.

That is, 73 per cent of the traffic is through.

Mr. Fogle further writes: "Our line between Canton and Massillon, eight miles in length, runs on the public highway which before the time of steam railways was the thoroughfare for the stage coach with its through passengers, packages and mail, and on which wagon freighting, cattle driving, etc., were carried on, and no doubt the easement over this road was given by the original owners of the abutting property, because such traffic was to be carried on over it. It enhanced the value of their farms to have a public highway in front of them, that had the stage coach, freight and droves of cattle passing frequently; for might not the passenger thus see the desirable farm and become a possible purchaser, as against his going off down a lane to buy a place that could not be got at except by a private conveyance, either a-wheel or horseback. Now the interurban railway has brought to the old highway what the steam road took from it, and to the pecuniary advantage of the owners of abutting property; for it is a fact that farm lands along our road are today worth more than any others in the county, and because of the railway cars passing.

"One farm midway between our two towns was sold for over \$300 an acre at the time our road was built and laid out as a village, and since a number of lots have been sold and built upon. That farm before our line was built would

not have sold for one-third that price. The interurban is an accommodation to the country people living along the line, and generally they consider it so, as they are all anxious to have projected lines come their way. Many are willing to give a right of way through their lands if a private right of way is wanted, and we have yet to find the first landholder along a public highway who will not freely give his consent to a line in front of his property."

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Matthew Slush, president of the Milwaukee, Racine & Kenosha Electric Railway, writes: "The decision of the Wisconsin court that an interurban railway is an additional burden on the abutting property along a highway is, in my judgment, a step backward at least 30 years, and is a blow to the masses who are interested in cheaper fares. The facts do not bear out the court in conclusions reached, as it is not practicable to run electric cars on a highway in large trains owing to the electric railway having to conform to the established grade of the highway, and the gradients are usually such in the country as to make it impracticable to run more than one car in a train; also, it is not practicable from a financial standpoint. My experience, and I think the experience of electric railway men in general, is that it is best to give as frequent service as the business justifies, running a car every hour at least, and make a cheap rate; that is what the people appreciate and patronize.

"Our experience has been that we carry 14 local passengers to one through passenger, and that the people living along the line and in the immediate vicinity are its best patrons. Also, we find that land along the railway has been advanced in price and in many instances to my personal knowledge has been sold for from 50 to 100 per cent more than the prices asked before the building of the road.

"We have sidings or stations every two miles but we stop to take on or put off passengers at farm houses or any other point, and it is not an unusual thing to stop 100 times in making the trip from Kenosha to Milwaukee, 35 miles.

"It is not practicable to build an electric railway on a private right of way; first, because the people living in the country would have ready access to it only at cross-roads, which are one or two miles apart, and would place the road out of reach as a public convenience; and second, if the company were compelled to pay large sums for its right of way it could not give its patrons the advantages of the present low fares."

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From the foregoing statements and estimates we find but three of the twelve roads which have more through than local passengers, and on one of these the local traffic is 45 per cent of the whole. This, we think, is to be taken as evidence that the use of the highways in the country by electric railways is precisely similar to that of a city street by an electric railway—it is to facilitate travel and to relieve the highway of the vehicles that would otherwise be necessary to accommodate it.

As to the statement the "through travel is unquestionably composed of people who would otherwise travel on the ordinary steam railway," we believe the court was mistaken and venture the opinion, having in mind the relative frequency of the trains on the two kinds of roads, that a large proportion of the through passengers would otherwise stay at home and transact their business by mail.

## TEST OF THE LA FAYETTE, IND., STREET RAILWAY POWER PLANT.

BY G. W. MUNRO, E. E.

Abstract of Thesis Presented to the Faculty of Purdue University by G. W. Munroe, H. W. Cope, Albertus Fankboner and C. A. Simpson.

The power plant of the LaFayette Street Railway Company is on the bank of the Wabash river at the foot of South street and is a substantial brick structure one story high with steel trusses and slate roof. It is 55 ft. by 127 ft. and is divided into two rooms, a boiler room 54x55 ft. and an engine and generator room 73x55 ft. The main part was built in 1892, 109x55 ft., an addition of 18 ft. being added to the east end in 1896 when it became necessary to enlarge and remodel the plant.

In addition to the street railway system it furnishes power to a considerable system of 500-volt and 220-volt motors. The 220-volt motor load increases greatly in the summer when many fans are used and since the test a 70-k. w. generator has been added to meet the additional demand.

The boiler plant is equipped with three 250-h. p. Stirling water tube boilers, two of which are required continuously, leaving one in reserve. Each boiler is run about four weeks at a time, is then cut out, cleaned, and held in reserve two weeks.

The boilers are fed from the city water mains, the water flowing directly from the mains to an exhaust steam heater whence it is drawn by a 5x8x10-in. pump. The usual fuel is natural gas with coal in reserve in case of "low gas." The gas is piped from near Tipton, Ind., a distance of about 40 miles.

There are two simple Hamilton-Corliss non-condensing engines, one 22x48 in. rated at 250 h. p.; the other 28x54 in. and rated at 500 h. p. These engines are used as the exigencies of the occasion require, the smaller being used whenever it will carry the load; the larger, however, was in constant use during the tests.

The dynamo equipment consists of one 200-k. w. six-pole street railway generator, two 100-k. w. and two 60-k. w. bipolar street railway generators and two shunt wound 220-volt bipolar generators. The arrangement of the apparatus in the engine and dynamo room is shown in the diagram on the opposite page.

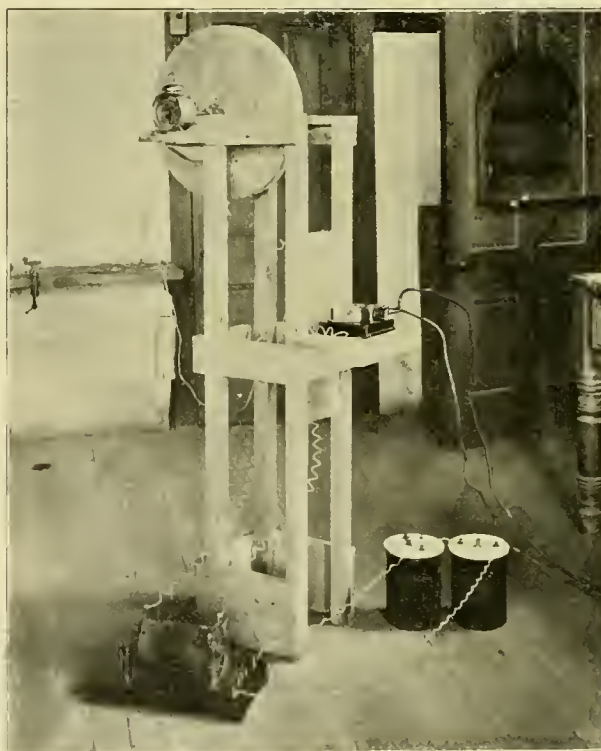
The switchboard is of oak and is provided with the usual switches, circuit breakers and lightning arresters so that each machine and feeder is amply protected. Connections from the machines to switchboard are underneath the floor.

The track system is divided into five lines, three of which run respectively to the north, east and south parts of the city. The others cross the Wabash river, one making a circuit through West LaFayette, the other going by a hilly and picturesque route to the State Soldiers Home and Tecumseh Trail Park four and one-half miles north. These lines center at the Court House Square, from which cars leave on the quarter, half and even hours on each line except that to the Soldiers' Home. Other cars leave the outer ends of the lines on the return trip at the same time, the two cars giving the required fifteen minute service. On the Soldiers' Home line the service depends largely on the demand, varying from an hour in the winter to 15 minutes in the summer. About half a mile from the court house all of the outward bound cars strike a hill, the rise on four lines being abrupt

and taxing the motors to their utmost when the cars are heavily loaded. On the other line the rise, while decided, is more gentle.

The result of these conditions of schedule and grade is a very peculiar load curve on the station, the load varying from almost nothing when the cars are at the ends of the lines to a maximum of several hundred amperes with the cars on the hills.

To determine this curve we designed and constructed in the laboratories of Purdue University, a recording ammeter which is shown in the illustration. Briefly it is an apparatus to pass an arc of paper in front of the swinging needle of an ammeter at a uniform speed. Electric sparks from the needle perforate the paper, the line of perforations being easily traced with pencil or pen. The paper moved 1 in. a minute which was rapid



RECORDING AMMETER.

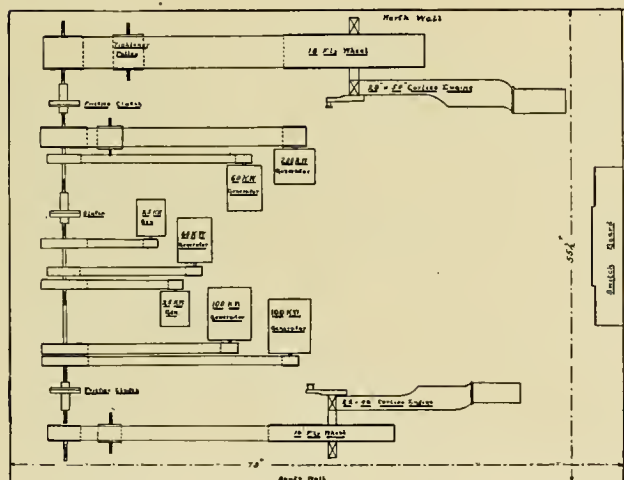
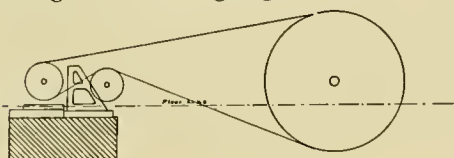
enough to give the principle characteristics of the curve though many of the more minute fluctuations were undoubtedly lost. Some of the curves are reproduced showing the load distribution over trip intervals. The same intervals are marked with an \* in the all day load curve. The curves all show that the watch used during the test was about one and one-half minutes faster than the car time. The first of the two curves given is entirely representative of the trip curves of the road under light load and with cars on schedule time. Three of the cars stop to cross a railroad causing a drop in the curve about one or two minutes after starting. A high starting current is then noticed which falls off somewhat as speed is attained and the maximum is reached when the cars strike the hills shortly after. The outward bound cars pass those coming in at the tops of the hills and here there is a decided dip in the curve. The dip when the railroad is crossed by the incoming cars is noticed



after 13 minutes. The hurrying of one or two cars, probably from the west side, which are a little late, is noticed at the end of the curve. During the trip shown the mean current is about 100 amperes with 350 as a maximum.

The other curve illustrates an entirely different set of conditions. It was taken just after a heavy thunder storm amounting almost to a cloud burst and shows the cars well loaded and about two minutes late. There is no waiting at the terminals, but little drop at the railroad and the hills are made with a rush that throws the ammeter needle entirely off the paper.

The tests on the station were made Friday and Saturday, March 18 and 19, 1898. The test on the first day began at 5:43 a. m. and ended at 11:32 p. m., with natural gas for fuel; on the second day the run was between 6:07 a. m. and 11:08 1/2 p. m., the boilers being fired with coal. As the object of the tests was to determine the behavior of the station under its usual running conditions, no effort was made to improve its usual performance in the least. The regular attendants were on duty with directions to run as though nothing unusual was going on.

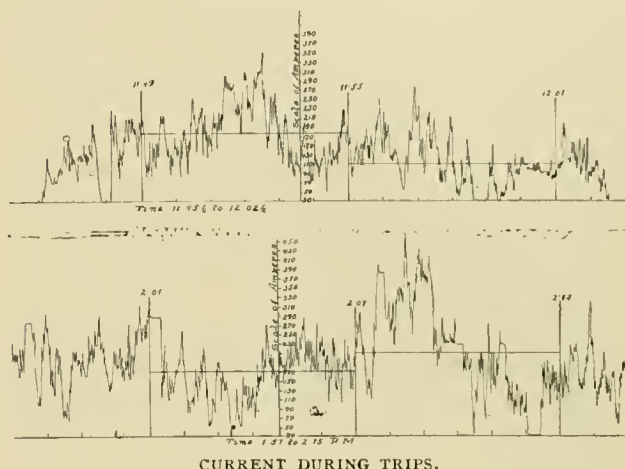


PLAN OF ENGINE AND DYNAMO ROOM.

The instruments used, with the exception of the gas meter, were calibrated in the university laboratories and proper corrections made in the calculations. The recording wattmeter used to measure the combined output of the 500-volt machines was new and was lent by the manufacturer. It was compared with a Thompson composite balance and found to have an inappreciable error within the limits of observation during the tests.

During the entire period of the tests the following readings were taken every six minutes: Boiler pressure, feed water temperature, gas meter (first day), indicator cards, recording wattmeter, voltage in 500-volt and 220-volt circuits and current in 220 volt circuits. There were also two men weighing feed water and two taking records from the recording ammeter, making 13 observers continuously on duty. These men were nearly all members of the senior class in electrical engineering and were perfectly familiar with the instruments they were using.

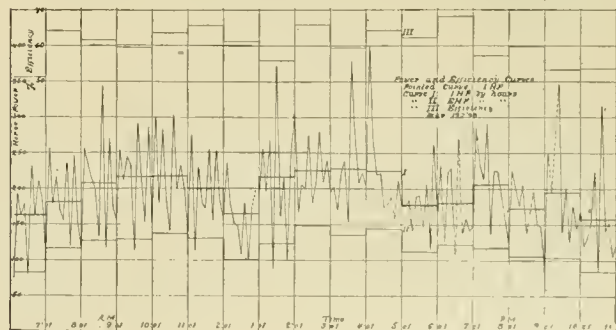
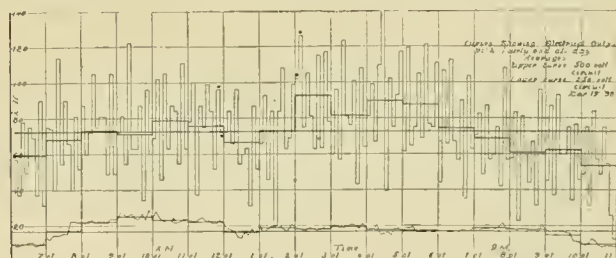
In testing a station of this kind where the loads are varying and irregular, the question always arises, how nearly do the results obtained by taking periodic readings represent the true values, for a given time? It was, therefore, with considerable interest that we made the comparison between the power as given by the recording wattmeter, and that as determined by periodic readings of voltmeter and ammeter



CURRENT DURING TRIPS.

over certain hours of the second day's run. During the nine hours compared, the greatest error for a single hour was 11.5 per cent while the mean error for the nine hours is only .58 per cent.

The results of the two days are placed side by side as far as possible for ease in comparison. One boiler had been in



CURVES SHOWING LOAD AND EFFICIENCY.

service two weeks since cleaning, while the other was cut in on the morning of the first day.

These results show a very low rate of evaporation, especially on the coal test. This may be accounted for by the poor quality of coal and the very low average load on the boilers. The quality of the coal can, perhaps, be best estimated by comparison with the gas in evaporative value. During the tests 13,560 cu. ft. of gas at atmospheric pressure

and 62° F. was equivalent to one ton of coal, while the usual relative values are about 30,000 cu. ft. to the ton. It would seem at first thought that a single boiler would be sufficient to furnish the power, but it must be remembered that at times the demand is greatly in excess of the capacity of one boiler, and the rapidly varying demand is peculiarly adapted to the carrying over of great quantities of entrained water to the engine.

The value of the exhaust steam heater is well exemplified in this test. Besides its use as a water purifier it supplies an average of 13.6 per cent of the heat given to the water and saves that per cent of the fuel and that without perceptibly increasing the back pressure of the engine.

The observed data for March 19 are given in the accompanying curves of load and i. h. p. On the curves of i. h. p. dotted lines indicate that one or both cards were missed and the point supplied by estimation. The hourly averages, given on the same plates, really give the load curve for the day and these have been used in obtaining the efficiency curves. When the averages over certain times are plotted it has been done by drawing a horizontal line at the proper height extending over the whole time, these horizontal lines being connected by vertical lines to show the continuity of the curve.

The friction of the engine and short jackshaft to which it is belted was 40.8 h. p. while the entire station load was 74.4 h. p. The speed regulation of the engine under the sudden changes of load was almost perfect it remaining nearly constant at 79.6 r. p. m. throughout the whole period. In one instance two diagrams taken on the same card showed a change of 45 h. p. on one end of the cylinder between two strokes, indicating a total change of about 90 h. p. in about one second.

Supt. E. B. Gunn estimates the station running expenses exclusive of fuel at \$9.25 with gas burned which, on the day of the test amounted to \$8.95, making the total cost of power for the day \$18.20. This is 1.11 cents per k. w. hour output and 1.65 cents per car-mile. With coal as the fuel the running expenses are \$10.75, coal \$17 or a total of \$27.75 per day which is 1.73 cents per k. w. hour and 2.50 cents per car mile.

The following is a summary of the principle results of the tests.

#### REPORT OF TEST.

	March 18.	March 19.
Duration, hours .....	17.525	17.025
Grate surface, sq. ft. ....		57.69
Water heating surface, sq. ft. ....	2,875.	2,875.
Temperature of feed water entering heater, degrees F. ....	48.2	48.2
Temperature of feed water leaving heater, degrees F. ....	206.4	204.4
Steam pressure, lbs. abs. ....	103.3	107.2
Total coal, lbs. ....		17,644.
Moisture in coal, per cent. ....		6.9
Total refuse, dry, per cent. ....		5.5
Dry coal per hour, lbs. ....		964.4
Total gas by meter, cu. ft. ....	122,700.	
Total gas reduced to 62° F. and 30 in. of mercury, cu. ft. ....	131,504	
Pressure of gas, lbs. abs. ....	14.865	
Total water pumped to boilers, lbs. ....	104,990.	93,047.
Quality of steam assumed 98 per cent dry. Equivalent evaporation from and at 212°, lbs. per hour. ....	6,137.	5,627.
Actual evaporation per lb. dry coal, lbs.		5.55

Equivalent evaporation per lb. dry coal, lbs. ....		5.82
Equivalent evaporation per lb. combustible, lbs. ....		6.16
Actual evaporation per 1,000 cu. ft. gas, lbs. ....	840.4	
Equivalent evaporation per 1,000 cu. ft. gas (62° F. and 30 in. mercury), lbs.	819.1	
Dry coal per sq. ft. of grate, lbs. ....		8.36
Commercial horse-power (boilers) ....	177.9	163.4
Average i. h. p. (engines) ....	193.8	192.8
Average e. h. p. (generators) ....	123.6	121.7
Commercial efficiency, per cent. ....	63.8	63.1
Water per i. h. p. hour, lbs. ....	30.36	27.61
Gas (standard condition) per i. h. p. hour, cu. ft. ....	38.65	
Coal per i. h. p. hour, lbs. ....		4.97
Total k. w. hours. ....	1,638.7	1,594.4
Watt-hours per 1,000 cu. ft. gas. ....	12,480.	
Watt-hours per lb. coal. ....		97.1

While the tests show a somewhat low efficiency and low output per pound of coal, we can not criticise the station or its management for it, but must rather look for the reasons in those conditions of profile and schedule which necessitate the use of so much machinery for so little work. The average demand for either day was less than two-fifths the rated capacity of the installation necessarily running, and all things considered the station performance is very good indeed.

#### LETTER BUILDING.

The letter builder and color mixer in the street railway shop is necessarily something of a chemist, designer, color mixer and monogram builder as well as a painter of letters.

Referring first to the color department. This is usually under the direction of the color chemist, who, if he be a suitably trained man, has also the supervision of the other operations in the process of car lettering where chemical knowledge is required. Again we sometimes find this department under the direct control of the sign artist himself. A well-equipped laboratory is most essential in any case, wherein all experimental work and color testing can be performed. The work of the color chemist consists in making examination and comparative tests of new color stuffs introduced from time to time, in testing the purity and strength of the color ingredients received, making any new shades required, and matching the various colors which are called for in the make-up and color ornamentation of new signs for cars. Another important branch of color chemistry, which is apt to be neglected, is the experimental research work. This comprises the investigation of the many causes of irregularity in the colors.

These and many others are interesting and important questions to every color chemist. New invoices of color stuffs are tested before being put into use, by comparing their strength and purity, with standard samples kept in the laboratory. Every new lot or "batch" of color made is painted, as a trial, on a small sample board. This is steamed, washed and dried, and then compared with the standard shade preserved in the color book. To the color maker this book is invaluable, as it contains standard duplicates of every shade used. If the newly-made colors prove a little off the "standards," they must be altered by the addition of the proper compounds to bring them to the correct shade. This matching or examination of the colors forms



the most important duty of the colorist, and often he finds it no easy task before a perfect match can be obtained. The quality of the daylight, the nature and behavior of the paint examined, the material on which the color is put, all affect to a marked degree the general appearance of shades. After long experience car letter painters and color mixers can tell very closely the exact amount of color ingredients necessary to give the right shade.

The whole secret of monogram writing lies in the one word—practice. Of course one must know what methods to pursue, but without practice and patience book-learning will not enable the painter to make a readable sign. I believe that, under proper instruction and with perseverance, any one can make good letter plans; the art is not peculiar to any one class of men. Take my own experience as an example; I did not know how to make the commonest sort of a letter for a monogram, and my first attempts were really laughable. But I practiced faithfully until I was able to make a design I was not ashamed of; I first practiced with simple line letters, then made full face work, going finally to more fancy effects. I then practiced with three-letter combinations, and next I took up words. These were made in plain colors for a time, and then I took up the shades.

The colors for this work must of course be made up of a consistency which will answer the purpose and not run or "bleed," one into the other, and for this flour paste has been found, by long practice, to be the best and perhaps the cheapest. Flour paste can be obtained for this purpose of various qualities, but it will be found poor policy to procure the lowest grades, for the reason that they are not uniform, and further, when this paste is made from such qualities, a greater amount is required, and it will not keep as long after being made.

Other thickeners are to be had, several of which find favor with many color mixers, the most important being starch and sago. A very good paste is made of gums, the most valuable being that from tragacanth; but, owing to the cost, this is seldom used.

Pastes are of two kinds; that used for thickening the so-called "standards," that is, colors made up and kept in stock, from which are drawn, as occasion requires, portions to be mixed with each other for making up the actual printing color; and that made from flour, which is for diluting the mixed standards. The former is usually a thickener made up of gum dextrine and water and is very well suited for the purpose, being cheap and effective. Dextrine comes into the market in two forms; one is a brown gum, sometimes called "roasted starch," the other is the white variety, made by a different process. The brown gum is the best for this purpose. It is starch of any variety, usually corn or potato, which has been kept for some time in an oven heated to a temperature of 400° F., when its composition has been so changed that it is soluble in water.

The substances which can increase the stiffness of the colors are starch, dextrine, the various gums, gelatine, etc. Gum arabic and gum tragacanth may be used when it is not required to give too much stiffness and not to modify the color. Gelatine gives much stiffness and is cheaper. When starch is used, which is now not a frequent thing, the best qualities must be chosen to prevent humidity and alteration. It can be obtained in the following manner: About 15 parts of starch are mixed with 75 parts of water, and 8 parts of caustic soda solution added, stirring constantly. After about two hours, the mixture becomes clear and like

jelly. Then it is neutralized with exactly the required quantity of sulphuric acid solution. The composition can be strengthened with gum, dextrine, kaolin, etc. It is better not to cook the starch with the soda solution, but to work it cold. Of course, after neutralization, it can be cooked without any inconvenience; it swells and thickens again, preserving its primitive qualities.

Oxalic is the most important acid used by the color mixer. This is usually purchased by him in cask lots and weighed out for each lot of color as occasion requires. It is ordinarily sold in a high state of purity. It is made in immense quantities from sawdust. Caustic soda is melted in a large iron pan and the sawdust added in suitable quantities; the cellulose is decomposed, forming sodium oxalate. The fused mass is allowed to cool and dissolved in water; milk of lime is added to precipitate the oxalate as a calcium salt, and then this latter is decomposed with sulphuric acid, forming sulphate of lime and oxalic acid in solution. This solution is evaporated down to the point of crystallization and the acid removed.

The acid thus obtained is one of the most powerful of the organic class. It is used by the color mixer for expelling carbonic acid and similar acids from their salts. The color mixer also uses the acid as a discharger. "F."

### HOW BADLY HE WAS INJURED.

T. J. Nicholl, vice-president and general manager of the Rochester (N. Y.) Railway Company, sends us a bill which was rendered to the superintendent of the Glen Haven Railroad by a passenger who said he had been in a slight accident that happened some time since.

The bill is as follows:

1 hat .....	\$3.00
1 umbrella .....	3.50
1 pair cuffs .....	.25
1 lady's hat, partly destroyed .....	1.75
Cleaning clothes .....	1.00
Picking glass out of face .....	2.00
Cut on arm .....	5.00
1 pint blood .....	5.00
	\$21.50
Fright to child .....	3.50
	\$25.00

### J. G. BRILL COMPANY'S WORKS.

The J. G. Brill Company has sent to its friends and patrons a handsomely framed lithograph giving a bird's-eye-view of the company's works. The frame is of fine grained oak, 30x45 in. The buildings cover more than 18 acres at the junction of the Pennsylvania and Baltimore & Ohio railroads in Philadelphia. A good idea is given of the arrangement and vast extent of these great works. This picture now adorns one of the walls in the REVIEW office.

### IMPROVEMENTS IN SPOKANE.

The Spokane Street Railway Company, of Spokane, Wash., is now engaged in relaying its Riverside line and making improvements in other parts of the city; the cost of the work together with the company's share of the new paving now being laid is stated to be \$40,000.

The rails are 7-in. girders, 72 lbs. to the yard and are being laid on concrete beams 8 in. deep and 15 in. wide. The joints are to be cast-welded by the Falk process.

## THE ELECTRIC RAILWAY: ITS GREATNESS AND POSSIBILITIES.

The advent of electric cars in our large cities, and the wonder and enthusiasm which followed in their wake is within the memory even of children still in school, for the successful operation of the trolley car comes within the bounds of the last decade. Measured by years, the trolley is, figuratively speaking, in its kilts; if by results it has reached sturdy manhood.

The activity in electric railway construction began at a time when the building of railroads had reached its zenith and commenced to decline. Every part of the country was interlaced with railroads which afforded quick and cheap transportation to the great centers of industry. This tended to augment the growth of the cities, and all records were broken in the increase in area and population of American municipalities. Business districts were congested and residents crowded as closely around these focal points as the value of property would permit. Thus a working or business man who lived a mile from his office or shop was within twenty minutes' walking distance; if two miles, he spent forty minutes each morning and evening going and returning.

to consult the maps of a few years ago. On the map of the city of Chicago the portion darkly shaded represents area incorporated within the limits up to 1869. The city at that time had a population of 275,000, with an area of 25.28 sq. mi., giving a density of 11,000 per sq. mi. The area in lighter shade represents that portion annexed up to April, 1889. The population was somewhat less than 1,000,000, and the area 36.66 sq. mi., giving a density of 27,000 per sq. mi. At the present time the area of the city is 188 sq. mi., with a population of 1,883,000, giving a density of 10,000 per sq. mi.

Greater New York is now in area the largest city in the world, including 307.85 sq. mi. within its limits and a population of 3,350,000, which gives a density of 10,800. In 1890 the combined area of New York and Brooklyn was 66.88 sq. mi., with a population of 2,320,000, and a density of 36,000. Boston, with a population of 200,000 in 1868, occupied less than 7 sq. mi., thus having a density of 30,000; in 1890 the population was 448,000, and the area 35.3 sq. mi., with a density of 12,700, and in 1898 the inhabitants increased to 550,000 and the area to 43 sq. mi., with

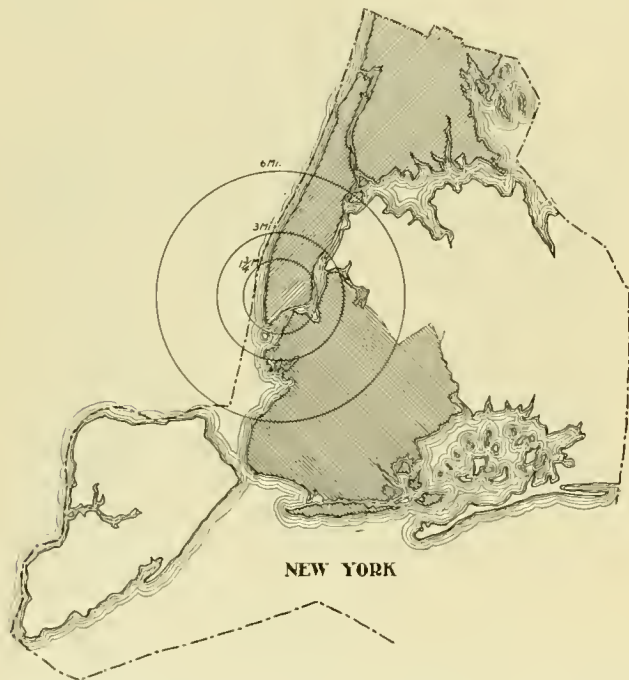


DIAGRAM SHOWING RESIDENCE DISTRICTS 30 MINUTES FROM CENTER BY WALKING, BY HORSE CARS, AND BY ELECTRIC CARS.

When the horse car lines were built, one could afford to live 50 per cent farther away, for that much time would be saved over walking. Then the trolley lines came and the man who cared to spend but twenty minutes on the cars could now live from three to four miles from his place of business. On the outline maps of New York, Chicago and Boston the circles represent approximately the distances from the business centers which a man could reside and reach his office within thirty minutes. The inner circle has a radius of one and three-quarter miles, which indicates the limits of convenient walking distance; the second is three miles, the limits of horse car traction, and the outer one is six miles, indicating the expanded area which is served by the electric cars in the same time. The areas of the three circles represent 9.6, 28.3 and 113 sq. mi. respectively, as available residence districts for a business man under the conditions of going to and from his office each day by walking, by the horse cars and by the trolley cars.

To fully realize how cities have spread out it is only necessary

the same density as in 1890. It is but fair to say that had Boston annexed contiguous cities and villages as have New York and Chicago, it would make a showing relatively as good as they.

From the statistics from these three cities it appears that the density of population is gradually decreasing, which is a most desirable condition. The decrease in the death rate in our larger cities is doubtless due as much to the spreading out and the making of comfortable homes as to any other cause. The trolley car has superseded thousands of horses which also contributes largely to the sanitary conditions of a city.

The urban population of the United States is increasing with great rapidity. Its proportion to the total was 3.35 per cent in 1790, when only 131,472 lived in cities of 8,000 and over; 8.52 per cent in 1840; 16.13 per cent in 1860; 22.57 per cent in 1880; 29.20 per cent in 1890, and at the present time this may safely be estimated at 35 per cent. In our cities are the homes of no less than 25,000,000 people. As the mileage of street railways is nearly in proportion to the number and population of the great



cities in a state it may be of interest to compare this mileage with the percentage of urban population.

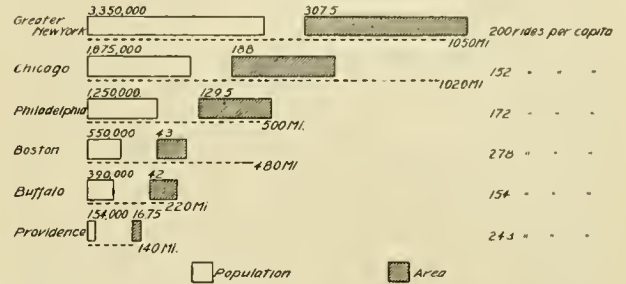
	Miles of Street Rty.	Per cent of Urban Population.
1 New York .....	2,100	69
2 Pennsylvania .....	1,750	46
3 Massachusetts .....	1,400	75
4 Illinois .....	1,250	48
5 Ohio .....	1,250	39
6 California .....	850	43
7 New Jersey .....	700	60

Thus in the states having the greatest street railway mileage more than half of the population live in the cities.

Do the people recognize the advantages of such transportation? We believe they do, or at least it is quickly realized if circumstances prevent the operation of the cars for a short time. If every man, woman and child in the country would have an equal opportunity to use the cars, at the present ratio each one would take 38 rides a year. Every day the street cars carry as many passengers as there are inhabitants in greater New York, Chicago, Philadelphia and Boston. But it is only the urban population who contribute directly to the street car traffic and in some cities the patronage is much more liberal than in others. There are many conditions which regulate this: the transportation facilities, the distribution of population, kind of industries, etc. Where the population is concentrated in tenement houses or where factories are distributed out over an area of the city with room about them for homes for the employes, the business is light and consists chiefly in pleasure riding.

considered that in nearly every city a ride of five miles can be taken for 5 cents, and often it is as great as 12 and 15 miles, it must be recognized that the electric cars furnish not only good but very cheap transportation.

The diagrams, giving the population, area, miles of street railway and average rides per capita per year in six of the largest

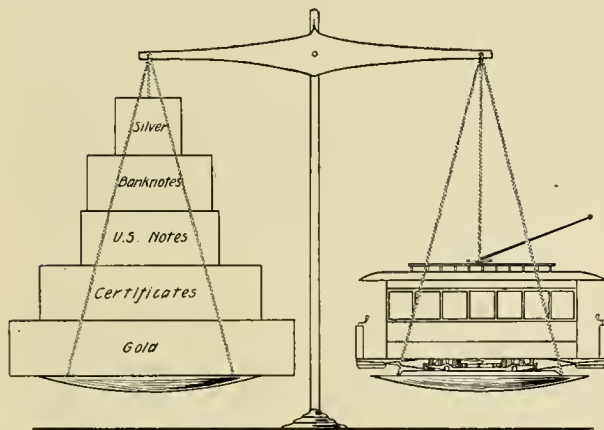


DIAGRAMS SHOWING POPULATION, AREA, MILES TRACK AND RIDES PER CAPITA.

cities in the country, furnishes some interesting comparisons. It would be natural to assume that in cities spread over a great area the patronage would be most liberal, but the figures of these six cities do not corroborate such a conclusion. Chicago and Philadelphia are spread out over vast areas but the average rides per capita are not so great as in Boston and Providence, cities of very limited area.

Vast quantities of materials have been used in the construction of the 16,000 miles of street railways in the United States. No less than 33,000,000 ties have been placed in the roadbeds, and these have required the destruction of a great forest to supply this 800,000,000 ft. of timber. The track rails, if stretched end for end, would make a shining band of steel around the equator, and there would be enough remaining for an axis extending from the north to the south pole. These rails weigh 3,500,000 tons, and represent the entire output of all the rolling mills in the United States for two years.

The question of power for running the electric cars is an important one, and in the aggregate presents some significant figures. It is estimated that there are in the electric power stations in this country 525,000 h. p. each of boilers, engines and generators. To keep these machines in operation requires the consumption of 2,300,000 tons of coal per annum. This means an evaporation of 3,300,000,000 gallons of water into steam. If all the boilers were concentrated in one place it would be necessary

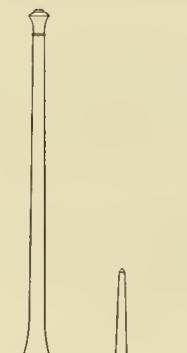


WHAT STREET RAILWAYS COST.

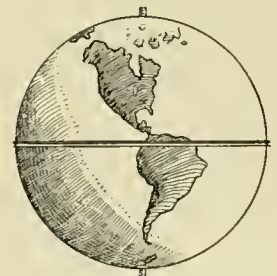
To purchase the street railways would take all of the \$525,000,000 of gold, the \$120,000,000 of silver, the \$400,000,000 of certificates, the \$225,000,000 of National bank notes and the \$250,000,000 of United States treasury notes in circulation. If the street railways were to be sold the sum realized would easily pay the debt of the United States.

A fair estimate of the paying passengers carried by the street railways per annum would be 2,660,000,000, and this would be increased by 50 per cent if the transferred passengers were included; which, in the aggregate represents two rides for every inhabitant of the globe; and tells its own story when compared with the 535,000,000 carried annually on the 182,000 miles of steam road in this country. While it is difficult to determine the average passenger mileage ride, yet an estimate of three miles is certainly moderate, and the length of haul is constantly increasing as cities expand and suburban and interurban lines are extended.

The fact that the trolley car is a great economic factor may be seen by comparing the cost of transportation on the street cars and on the steam cars. The gross income of the street railway companies is approximately \$115,000,000. If the passengers carried by the trolley cars had to pay the regular 3-cent fare charged on steam roads the amount would be more than doubled, but if only the 2-cent per mile rate were charged the patrons of the street cars would still save over \$45,000,000 a year. The average length of ride on the steam roads is 26.2 miles, and the average rate is 2.04 cents per mile. When it is



HEIGHT OF A SINGLE POWER-HOUSE STACK.



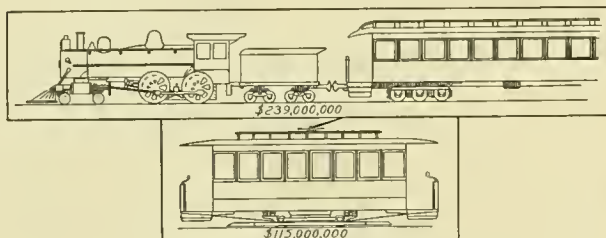
LENGTH OF RAIL USED BY STREET RAILWAYS.

to build sixteen stacks the size of Bunker Hill monument, or one great stack, the comparative volume of which is shown in the figure.

To operate the present street car equipment would require 320,000 horses, which, if harnessed two abreast, would form a solid procession extending from Chicago to Cleveland; but to transport the passengers carried by electric cars in the slower going horse cars would necessitate one-third more cars than now, and this would extend the line of animals to 480 miles.

Two hundred thousand men constitute the trained army of actual street railway employes, for in addition to the car crews are thousands the public never see but whose part is just as essential—the executive and operating officials; lawyers to defend the company against the incursions of blackmailers; electricians, engineers, firemen, car and track repairers, and a host of others. Then there are thousands more who find employment in building cars, trucks, motors, engines, boilers, generators, and the innumerable devices, parts and machines essential to a road. The iron and coal mines, and the rolling mills lend their forces, and in fact one hardly knows where to stop in recounting the diversity of interests which find existence in supplying the street railways of the country, for there are few industries which are not benefited in the course of the year.

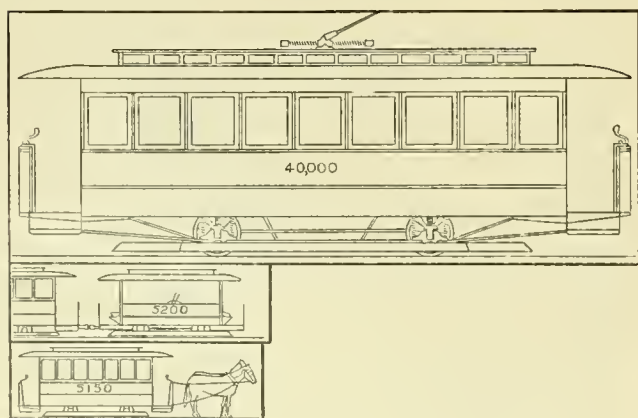
And what of the safety of the millions who intrust themselves to the electric car? The answer is simply amazing when one considers that for several hours each day the busiest streets show an almost unbroken line of cars, some turning to the right,



STREET CAR FARES; ACTUAL AND AT 3 CENTS PER MILE.

others to the left, and still others darting back and forth across the track like a weaver's shuttle. The average electric car travels 120 miles a day; each one of its wheels makes 84,500 revolutions, and in the course of a year passes over 8,000,000 rail joints; yet with all this constant wear and opportunity for accident from breakage, a passenger is as safe on a trolley car as in the retirement of his own home. Only one in 23,000,000 passengers is killed, and only one in 800,000 is injured in any way and if a man were to spend his time on the street cars waiting for a chance to present a damage claim against the company he would have to travel one hour a day for 31 years and spend \$1,130 in car fare before he would be hurt. Before his time for being killed would come he would be a patriarch of five and a half centuries, having been continually on the cars day and night. Considering the service rendered the safety feature of the street car is truly remarkable.

The rapid growth of electric railways is almost unprecedented in any line of industry, yet it has by no means reached its full



NUMBER OF ELECTRIC, CABLE AND HORSE CARS.

development. The interurban roads building in every part of the country are filling up a gap between the street railway and the railroad. The smaller towns and the cities are joined by electric lines which give a frequent, cheap and comfortable service. Not only are passengers carried between local points, but also mail, packages, farm produce and even the output of

the factory. This is a function which has been but poorly performed or not at all by the railroads. These electric lines bring large communities in close contact, open up new markets, facilitate the transportation of goods and passengers and are feeders to the trunk lines of steam roads. Where this expansion will cease no one can tell, for long lines are now in operation which were deemed impractical five years ago, and even greater and broader undertakings are being planned.

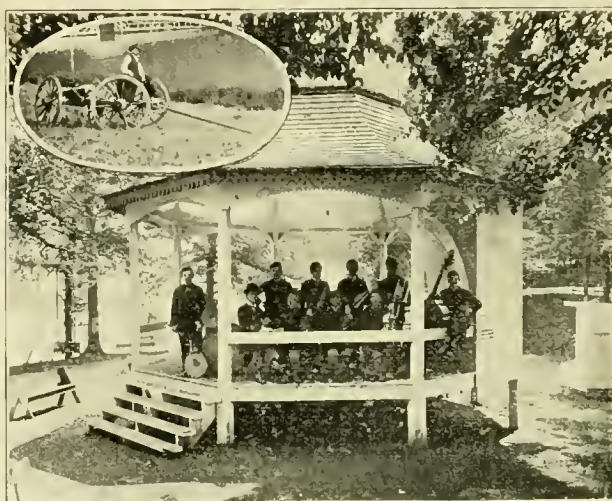
## NAVAL DISPLAY AT PLEASURE RESORT.

At Clyffside Park the Ashland (Ky.) & Catlettsburg Street Railway Company gave a realistic reproduction of the capture of Ponce Bay, Puerto Rico. The famous Gloucester, commanded by Lieut. Commander Walwright, was represented as entering the port and demanding its surrender after some sharp firing.



THE GLOUCESTER ENTERING THE HARBOR.

The Gloucester, two Spanish gunboats, Spanish forts and block houses were constructed, as shown in the illustrations. They were manned by 40 men, who fired shells and bombs for an hour, and finally blew up the gunboat and fort, much to the delight of an audience of 5,000. The exhibition was managed to the satisfaction of everyone. The company has engaged the Columbian Orchestra, of Cleveland, for the season, giving two free concerts daily, which have proven great drawing cards. Clyffside Park is far famed for its location, and the popularity of its attractions is due largely to ideas of Willis L. Ringo, president of the railway company.



BAND STAND.



## STREET RAILWAYS AND REAL ESTATE.

Street railway men fully realize the beneficent results which accrue to the public in the extension of electric lines beyond the congested residence districts, but it is seldom the daily press of the country are generous enough to give the men and companies which are instrumental in this good work the credit they deserve. The Buffalo "Express" has been making some research on the subject, and gives a resumé of its results in the following:

Boards of assessors and other officials connected with the municipal government in many large cities have recently engaged in a systematic examination of the question of the extent to which values of land in such cities have been affected by the operation of electric railroads, and some valuable information has been elicited. Doubtless the facts that have been demonstrated in this regard in other cities will hold good in Buffalo.

To define the areas definitely affected by the electric railroads three circles may be drawn upon a city map, the first, or inner circle, including first-class business property or the heart of the city. This naturally takes in the City Hall, the banks and the

tions have attracted clerks, mechanics and wage-workers to these outlying districts, and in compliance with the law of demand and supply values have thus been distinctly stimulated. To a remarkable extent, also, well-to-do people are now moving out on the interurban and acreage property beyond the outskirts of large cities. Such districts are showing a marked improvement in value and will doubtless do so for a long time to come.

## BICYCLE CARS IN ROCHESTER.

The Rochester Railway Company is trying the experiment of running bicycle cars as trailers on the lines extending to Ontario Beach and Summerville. A bicycle car is an old trailer, with racks fitted on the floor and seats of the car so that about 25 wheels can be accommodated. A sign is placed on the side, stating that the car is for bicycles only and no passengers will be received on that car. The wheelman receives a check corresponding to the number fastened to his wheel, and rides in the motor car with the other passengers. No charge is made for



NAVAL DISPLAY AT CLYFFESIDE PARK, ASHLAND, KY.

choice shopping district. Within this circle values are constantly appreciating, and have done so even since the depression began. Such property is always in demand for investment, and its value will continue to increase as the earning power of money at interest decreases. Usually the circle represents the central objective point of the local transportation companies.

Between the first and second circles will be included, to carry out the illustration, the inside residence portion of the city, in a distinctively residential city, or, in case of an industrial city, that part within reasonable proximity to the factory district. The electric transportation facilities have caused values within this area to decline, as it has been necessary to lower rents to keep tenants. There can be no mistake about the influence of the electric railroads on this class of property, even when full allowance is made for the depreciation of both rental and selling values caused by the hard times.

The third circle includes the outlying district which has been made accessible by the electric lines. Here the greatest benefits of electrical transportation are met with. In this district there is a marked improvement of land values from the improved local transportation facilities, to which railway managers and real estate men in all parts of the country bear witness. The cheapness of the land, the low rentals and the improvement of living condi-

tion carrying the wheels, but no transfers are given, as the wheels cannot be transferred. General Manager Nicholl states that if the patronage is as liberal as it has been, a complete outfit of bicycle cars will be put on the lines next season.

Work has been in progress on the Jungfran electric railway for more than a year, and it is estimated that the construction work will be completed in 1899.

A report was current that the Market Street Railway Company, of San Francisco, was about to equip some of its lines with compressed air motors as investigation had shown a considerable saving in their operation over electricity, but this is entirely without foundation, for General Manager Vining states that no such change is contemplated.

The number of passengers carried on the Sheffield tramways last year was 8,453,074. As an illustration of the manner in which a good electric system stimulates traffic is shown by a comparison with the figures from Montreal. In the corresponding period 32,047,317 passengers were carried while the population of the Canadian city is much less than that of Sheffield. A private company operates the railways in Montreal but in Sheffield they are controlled and hampered by the municipality.



## ARCING IN CONTROLLERS.

In these two illustrations the action is plainly shown of a solenoid coil on the arc formed between the contact finger and cylinder in the type "S." solenoid blow-out street railway controller, manufactured by the Walker Company. These two cuts were taken direct from photographs without retouching or alteration of any kind. The apparatus shown is a short section



FIG. 1.

of a controller cylinder, with contact fingers and solenoid partitions in exactly the same relation to each other and working under the same conditions as in a complete controller in practical operation.

Fig. 1 shows the arc formed with the solenoids inoperative and it will be readily seen how destructive such an arc would be to contact fingers, insulation, and in fact every thing that it could reach. Fig. 2 shows the arc from the same current and under the same conditions blown out by the solenoids. These

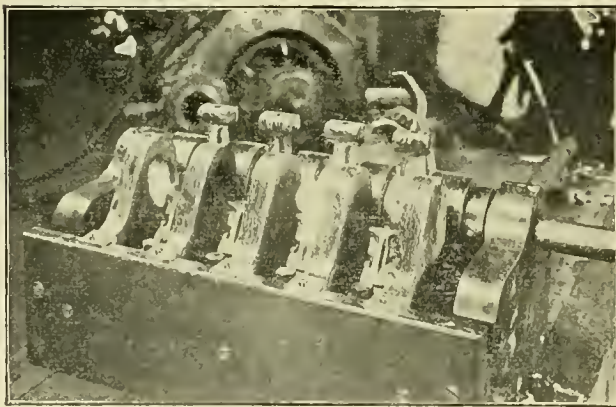


FIG. 2.

views, more than any argument, show the immense advantage of the solenoid blow-out in controller construction.

This controller has proved very popular since it was placed on the market about a year ago and has given universal satisfaction. The principles used in its construction are new and most ingenious.

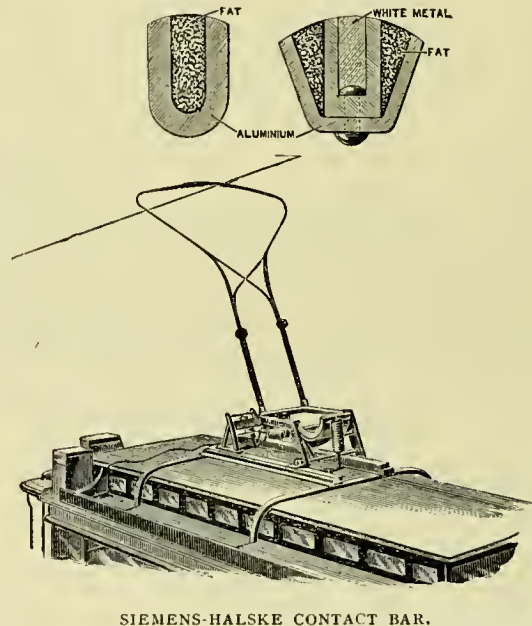
The annual meeting of the Concord (N. H.) Street Railway Company was held on September 6 and all of the directors were re-elected. The report stated that in spite of the commercial depression of the last year the earnings of the road were greater than ever before. The passengers carried numbered 1,039,573 and the gross earnings amounted to \$52,439, with net earnings of over \$7,000, and this in spite of a reduction in fares on the interurban and park lines. There have been many improvements made during the past year.

## SIEMENS-HALSKE SLIDING CONTACT BAR.

The Siemens-Halske Company, Berlin, has been a consistent advocate of the sliding contact bar in place of the trolley wheel. A number of improvements have been made recently and applied at Hanover and Dresden, Germany. At first an iron bar was used, but this was unsatisfactory, rapidly wearing the wire and causing disagreeable noises. This type was replaced by brass, but the latest are made of aluminum, which reduces the inertia of the bar and frame and thereby reducing the pressure necessary for good contact.

Two sections of the aluminum bars and a view of the frame are shown in the illustrations. A slot for grease is provided, which reduces the friction. The life of the aluminum bar is from six to eight weeks, or about 4,800 car-miles for small sizes, or 12,000 car-miles for the larger size. The cost of maintenance is about .0168 cent per car-mile.

The triangular form of the frame is very satisfactory, as there is no danger of hooking on the wire, and if the arch should



SIEMENS-HALSKE CONTACT BAR.

slip from under the wire when it is considerably off the center of the track, the friction of the trolley wire and sides of the frame will bring the arch under the wire again, this being assisted by the elasticity of the side bars of the frame.

It is impossible for the bar to strike the span wires; it does away with overhead frogs and switches, and the contact with the wire is not accidentally broken. The frame automatically reverses itself, thus dispensing with the attention of the conductor at the end of the line. The pressure against the wire does not exceed 7.5 lbs. With the latest form of contact bar the wear on the wire has been nominal.

## AN OPEN TRAM CAR IN LONDON.

The following quotation from the "Electrical Engineer," of London, sounds rather out of date in this era of electric cars. It calls to mind accounts such as appeared in the American papers seven or eight years ago when electric traction was still in a primitive stage:

"A new tram car has just been introduced for the short length of line between Rye-lane, Peckham, and Lordship-lane, Dulwich, where it is attracting much attention. It is a capital summer car, with open sides, and can be boarded at either side and at any point along either side. The cars are at present drawn by horses, but this type of electric car has found much favor on the Continent."



## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

**Degree of Care Imposed on Person Crossing Tracks Is Same as Company's.***Burgess v. Salt Lake City Railroad Company (Utah), 53 Pac. Rep., 1,013. June 15, 1898.*

A person, in crossing a street having street car tracks thereon, the supreme court of Utah holds, is bound to exercise the same degree of care which it is incumbent upon the railway company to exercise.

**Explosion of Fly-Wheel in Power House Not Evidence of Negligence.***Piehl v. Albany Railway (N. Y.), 51 N. Y. Supp., 755. May 10, 1898.*

The mere fact of the explosion of a fly-wheel which was purchased from the manufacturers and had been used for two years on an engine used in generating the electrical power by which street cars were operated, the third appellate division of the supreme court of New York holds, is not presumptive evidence of negligence.

**Liability in Starting Car Before a Woman Has Obtained Her Seat.***Dochtermann v. Brooklyn Heights Railroad Company (N. Y.), 52 N. Y. Supp., 1051. June 21, 1898.*

Assuming that the liability in the operation of electric cars is no greater than that of horse cars, the second appellate division of the supreme court of New York holds that, considering the frequency of the occurrence of such accidents, a jury might properly find that it was want of even ordinary care to start a car until a woman who had got aboard it had obtained her seat, whatever may be the rule when the passenger is a man.

**Electric Street Car Is Not "Locomotive Engine or Train Upon a Railroad."***Fallon v. West End Street Railway Company (Mass.), 50 N. E. Rep., 536. May 20, 1898.*

A conductor on an electric street railway car having sustained personal injuries through the alleged negligence of the motorman, brought an action to recover damages, from the company, under the provision in section 1, of chapter 270, of the Massachusetts Laws of 1887, making the employer liable for injuries to an employe resulting from negligence of a fellow employe in charge of a "locomotive engine or train upon a railroad." But the supreme judicial court of Massachusetts thinks that a car belonging to a street railway operated by electricity, and operated in the manner in which cars upon street electric lines usually are, cannot be said to be a locomotive engine or train upon a railroad, within the meaning of the statute in question, and so holds.

**Failure to Sound Gong Does Not Necessarily Imply Negligence***Citizens' Railway Company v. Holmes (Tex.), 46 S. W. Rep., 116. June 8, 1898.*

The general statute that relates to the duty of the operation of railway trains on the subject of blowing the whistle or ringing the bell does not apply to street railways, the court of civil appeals of Texas holds, as also that, where there is no statute or ordinance requiring it, it cannot be conclusively assumed that failure to ring a bell or sound a gong and to continue to do so prior to a collision are acts of negligence, but that must be left to the determination of the jury, according to the circumstances of the case.

Another point made by the court is that it is not only the duty of one when cognizant of an approaching car to exercise caution,

but it is also his duty to exercise diligence, to ascertain if a car is approaching.

Inability to hear and defective vision, it adds, may be considered on the question of negligence, upon the part of the plaintiff, in exposing himself to peril.

**Value of Gratuitous Medical Treatment Cannot Be Recovered in Personal Injury Cases.***Morris v. Grand Avenue Railway Company (Mo.), 46 S. W. Rep., 170. May 24, 1898.*

As something of a new question, in that state, the supreme court of Missouri, division No. 1, holds, that, in a personal injury suit, against a street railway company, the value of medical treatment gratuitously furnished the plaintiff, as for example in a hospital, cannot be recovered as an element of damages. The proof of the value of the gratuity exerted in one's behalf in relief of an injury inflicted, it says, is in no sense the proof of the expense to which one has been put, or the liability incurred, in the relief from that injury, while, to authorize a recovery on part of the injured plaintiff, there must have been an actual loss to him of time or money, or a liability that same may or will occur. Consequently, it seems, that when loss has not occurred, or cannot occur, by reason of the action of others, gratuitously exercised in behalf of the party injured, or when no legal liability has arisen, by reason of restrictions of law against the intervening third party performing the needful services, no action can be maintained.

**Watchfulness Required Where Children May Be Expected to Be Playing.***Bergen County Traction Company v. Heitman's Administrator (N. J.), 40 Atl. Rep., 651. June 21, 1898.*

A motorman in charge of an electric traction car moving in the public streets, where he has reason to expect little children are playing, the court of errors and appeals of New Jersey holds, must exercise a high degree of watchfulness in the operation of his car.

In this class of casualties, involving injuries by the cars of electric traction companies, going often with great rapidity in the public highways, to use other language of the court, motormen are properly held to a careful and constant lookout for every movement of human life on their front, and especially for the movements of children who are of such tender years as to be deemed incapable of contributory negligence.

That a child two years and three months old, to whom contributory negligence cannot be imputed, is suffered to roam unattended in the public street, it further holds, cannot relieve a traction company from liability for its negligence in the management of its car, resulting in the child's death.

**Conductor Not Required to Observe Track.***Macon & Indian Springs Electric Street Railway Company v. Holmes (Ga.), 30 S. E. Rep., 563. March 23, 1898.*

The supreme court of Georgia denies that, as a matter of law, it is the duty of the conductor of a street railway car to observe the track in front of the car and that portion of the street contiguous to the track on either side. The law not expressly imposing any such obligation, it says that the question as to what the duties of a particular conductor were in this respect was one of fact, and a subject-matter of proof, and that, in the absence of any proof showing that he was under any obligation of this kind, it was error for the trial judge to instruct the jury that such was the conductor's duty, and a failure in its discharge would be negligence.

The court further states that in a suit against a street railway company for personal injuries resulting by its car coming in contact with one who was undertaking to cross its track, the plaintiff cannot recover, if, by the exercise of ordinary care, he could have avoided the consequences of the defendant's negligence at any time after such negligence had become apparent, or he had reason to apprehend its existence.

#### Bolt Extending Below Car Does Not Import Negligence.

*Posten v. Denver Consolidated Tramway Company (Colo.), 53 Pac. Rep., 391. June 13, 1898.*

A passenger who attempted to alight from a moving car fell and, rolling under the step of a trail car, had his leg scraped and injured by an iron bolt which projected through the step for a distance of about an inch. When he sued for damages he charged negligence in the construction of the car by allowing the bolts to extend through the step of the trailer. But the court of appeals of Colorado holds that this could no more be said to be a negligent construction than would be the wheels under the car by which it was moved. Simply because the passenger was injured by the bolt did not raise a presumption nor make a prima facie case of negligence in construction. Especially was this true, it says, there being no contention nor proof that any accident which resulted in injury was caused by the failure of any of the machinery or appliances of the car. The bolt did not cause the passenger to fall. Nor is to be presumed, continues the court, that the obligation rests upon the carrier to so construct its cars that no injury can be inflicted upon a person who gets underneath a moving car. If it be possible to raise such a presumption, it must be done by testimony offered by the party who seeks to show or rely upon it.

#### Excessive Speed Alone Causes Liability for Accidents at Curves.

*Ayers v. Rochester Railway Company (N. Y.), 50 N. E. Rep., 960. June 7, 1898.*

It is well known that a car in passing around a curve is subjected to a somewhat violent motion. It is incidental to the situation, is something that must be guarded against by every passenger, and the railroad company is liable only when the speed is excessive. So holds the court of appeals of New York, which says that it would be a very harsh rule that would hold a company liable for a possible injury resulting while passing at a proper speed over a curve that has long been in use, and where no accidents are shown to have happened. In the case before it, where it reverses a judgment for damages, the plaintiff had just entered the car, which had stopped on a curve, and was thrown down by the violence of the motion of the car in rounding the curve and passing onto the straight track just as she was about to take her seat. This case, which it recognizes as a very close one, the court maintains falls clearly within the rule that where an accident is not the reasonable, natural, and probable result of the situation, which ought to have been foreseen by the defendant in the exercise of the degree of care exacted from a carrier of passengers, no liability follows, though if it could be shown that this degree of care was not exercised, a case for the jury would be presented.

#### Not Negligence to Give Up Seat There and Stand on Front Platform of Open Trolley Car.

*Still v. Nassau Electric Railroad Company (N. Y.), 52 N. Y. Supp., 975. July 11, 1898.*

A passenger who was standing on the front part of an open trolley car, having risen to give place to a lady on the seat immediately behind the motorman, was thrown off the car by a collision with an express wagon. The so-called "front platform" of the car being provided with a seat for passengers, the second appellate division of the supreme court of New York says that there could be no imputation of negligence in occupying that seat. The passenger suing arose therefrom to enable a lady to sit down.

Up to this time, it says, he certainly had not been negligent. Nor does it consider that it was negligence for him to remain standing there unless he knew or ought to have known that he was in a position of danger, from which he could escape by going inside the car, and had an opportunity to do so.

#### Passenger on Disabled Car Cannot Transfer Himself.

*Taylor v. Nassau Electric Railroad Company (N. Y.), 53 N. Y. Supp., 5. July 23, 1898.*

The fact that one of the cars operated by a street railway company meets with an accident, and cannot right away continue its trip, the second appellate division of the supreme court of New York holds, does not give a passenger on such car any new rights. His contract with the company is that it shall carry him between two points upon the line of road operated by it with reasonable speed, and in safety. It has a right, after the accident to the car which he is on, to transfer him to another if it thinks proper to do so, but, because of the fact that it does not elect to do this, he gains no right to transfer himself. The company, by refusing to make the transfer, takes upon itself the responsibility for its breach of contract with him, but it gives him no right to transfer himself. If he boards another car, refuses to pay fare thereon, and is ejected therefrom for refusal to pay such fare, the company's liability to him is not thereby increased.

#### Degree of Care Required of Person Attempting to Cross Tracks.

*Read v. Brooklyn Heights Railroad Company (N. Y.), 53 N. Y. Supp., 209. July 23, 1898.*

It was insisted, in this case, that a person was, as a matter of law, bound to look and listen before attempting to cross street railway tracks, and that, in the absence of proof that he did so look and listen, the street railway company was entitled to a verdict. This, the second appellate division of the supreme court of New York says, would be the law in respect to a steam railroad; but it does not apply to a street surface railroad, where both parties are making use of the highways, and where the crossing is made at the intersection of streets. There both parties are bound to use that degree of care which ordinarily prudent men would use under the circumstances—a degree of care commensurate with the dangers to be reasonably anticipated at such a crossing. A mere error of judgment on the part of a person attempting to cross tracks, coupled with his right to assume that the car would be operated prudently, will not defeat an action for damages.

#### When Nonsuits Should Be Granted.

*Posten v. Denver Consolidated Tramway Company (Colo.), 53 Pac. Rep., 391. June 13, 1898.*

No general rule can be laid down which can be made applicable, in all of its details, to every case, in such a manner as to relieve the trial court of any discretion. It is not necessary that there should be an absolute want of all evidence in order to justify the trial court in exercising the power of granting a nonsuit. The rule, which the court of appeals of Colorado thinks is not only well sustained and firmly settled by reason, but by the great weight of authority, is that when it appears to the court, looking at the evidence in the most favorable light for the plaintiff in which the jury would be at liberty to view it, that there is no evidence which would justify or support a verdict for him, then it is not only the privilege, but the duty of the court to sustain a motion for nonsuit.

In personal injury cases, based on alleged negligence, the court goes on to say, it devolves upon the plaintiff in the first instance to make out a prima facie case in his favor, showing that his injuries resulted from the negligence of the defendant. If he fails in this, or if it should affirmatively appear from his own evidence that a lack of due prudence upon his part was the proximate cause of his injury, it is the duty of the court, upon motion for nonsuit, to decide as a question of law that the action cannot be maintained.



### Liability Under Municipal Resolution for Cost of Paving.

*Storrie v. Houston City Street Railway Company (Tex.), 46, S. W. Rep., 796. June 13, 1898.*

The supreme court of Texas holds that a resolution of the city council, of Houston, providing that the cost of paving certain streets should be wholly defrayed by the abutting property owners as provided in a certain named section of the city charter, construed together with such section, which latter, not only provides that such cost shall be a charge against such abutters, but that any street railway company which occupies a part of the street or streets shall be liable for the cost of the paving between the rails of its tracks and six inches on each side thereof, must be taken to mean that the company shall pay for all the pavement between its rails and six inches on each side thereof, stated in said section, and that the remainder shall be paid for by the owners of the property abutting upon the said streets on each side. The word "wholly," as used in the resolution referred to, it holds, does not refer to, nor mean, the entire surface of the street, but means the entire cost of that portion which was to be paid for by the property owners.

The court also hold that the legislature had the right to enact the law of 1891, amending the charter of Houston, by which the liability of the street car company for the cost of paving the street was enlarged, and that said act does not violate the constitution of Texas nor of the United States.

And it declares that a loan and trust company claiming under a prior mortgage from the street railway company would not have any right superior to that of the latter company in the premises, as it says that it knows of no principle of law which would accord protection to a lien upon property when the protection would not be given to the owner.

### Municipalities Cannot Say When Street Car Companies Shall be Guilty of Negligence.

*Rockford City Railway Company v. Blake (Ill.), 50 N. E. Rep., 1070. June 18, 1898.*

The following city ordinance was admitted in evidence in this case: "All conductors, motoneers, drivers and persons employed upon street cars shall use reasonable and proper care and diligence to prevent injury or damage to persons, teams or vehicles, and upon the appearance of danger to any such person, team or vehicle upon or near the track cars shall be stopped, when, by so doing, such injury or damage may be averted." Permitting this ordinance to be read in evidence, the supreme court says, was clearly error; but it does not reverse the judgment against the company on that account, because it does not think that the company's rights were prejudiced thereby, as the trial judge, at the request of the respective parties, fully instructed the jury in regard to the law involved in the case, so that it did not seem that they could have been misled.

It is, no doubt, true, says the supreme court, that the city of Rockford had the power, by ordinance, to regulate the speed of street cars within the city and perhaps other wholesome police regulations might be adopted in regard to the management and running of cars; but it adds that it does not think the city clothed with power to determine when, or under what circumstances, a street car company should be guilty of negligence upon which a recovery might be predicated by a person who may have been injured. It is the duty of the court to instruct the jury in regard to the law by which they are to be governed in determining the liability or nonliability of the company.

### Continuing Operation of Lines a Public Duty.

*State v. Spokane Street Railway Company (Wash.), 53 Pac. Rep., 719. June 20, 1898.*

The supreme court of the state of Washington holds that a street railway company incorporated with power of eminent domain and to lay its tracks over the public street and highways, upon consent of the municipalities, is a common carrier, and, under the principles of the common law, owes a duty to the public to continue the operation of its street railway lines, including

lines acquired and held by lease, so that it may not, by its own acts, disable itself from performing the functions which were the consideration for the public grant.

That a company may have had no grant or privilege or franchise from the city or county to operate its tracks upon the public streets, and is simply a licensee from the owners of the additions to the city through which these streets run, the court does not think changes the obligation, especially where no objection has been made by the city or county authorities to such occupation, and it is in undisturbed use and occupation of these streets. Indeed, it says that a city could not object after more than five years of such occupation.

Therefore the court concludes that a street railway company, receiving its franchises from the state and entering upon the enjoyment of them, cannot cease to perform the functions which were the consideration for the grant of such franchises without the consent of the granting power.

It also holds that a person who lives adjacent to a street railway line, and owns considerable property there, which he has improved, relying upon the facilities afforded by this line, has such a material individual interest in enforcing the performance of the street railway company's duty to the public that he may maintain an action, in the name of the state, to compel the company, by mandamus proceedings, to operate the line, after an indefinite discontinuance. Nor does it deem it absolutely necessary that he should first make a demand for the operation of the line.

### Conductor Has No Implied Authority to Have Passenger Arrested After Ejecting Him from Car.

*Lezinsky v. Metropolitan Street Railway Company (U. S. C. C. A.), 88 Fed. Rep., 437. June 24, 1898.*

After a passenger was ejected for nonpayment of fare, where he and the conductor were of different opinions as to his duty to pay the fare, the conductor charged him with disorderly conduct, and requested a policeman to arrest him, which the policeman did. The man then sued the company for malicious prosecution and false imprisonment. Its liability, the United States circuit court of appeals, second circuit, holds depended upon the answer to the questions: First. Was the conductor acting in the course of his employment and within the scope of his authority, express or implied, in causing the arrest of the passenger, after he left the car, and or his prior disobedience? And, second, if the conductor acted without authority, was there any testimony from which a jury could properly infer a ratification by the company of the conductor's act in causing the arrest? Believing that both questions should be answered in the negative, the court affirms a judgment in favor of the company. It says that the subsequent act of the conductor in causing the arrest of the passenger was apparently outside of the course of his employment, outside of his service as a conductor, and was his act as an individual. It can not be inferred, in the absence of testimony, continues the court, that it is in the course of the employment of a conductor of a street cable car to cause the immediate arrest of a former passenger for his conduct in refusing to pay fare or to leave the car, and thus to take the risk of being compelled to leave his car in the street temporarily unprovided with a conductor, for here the passenger made a counter charge against the conductor and had him also arrested. Nor does the court consider that the company ratified the act of the conductor by the attendance and conduct at the police court of a clerk in its claim department, who was sent to the police court to "see what the matter was," though the clerk endeavored to show the magistrate that the conductor was in the right, whereby he "imitated the conductor in departing from his employment, without authority and with obtrusive meddlesomeness."

### Riding on Platforms of Electric Street Cars.

*Watson v. Portland & Cape Elizabeth Railway Company (Me.), 40 Atl. Rep., 699. June 13, 1898.*

The supreme judicial court of Maine maintains that it cannot be said, as a matter of law, that a person who sustains injury while riding upon the platform of an electric street car is, merely

from that fact, guilty of contributory negligence which will prevent his recovery of damages in an action against the carrier.

At the same time it holds that a passenger who rides on the platform of a car necessarily takes upon himself the duty of looking out for and protecting himself against the usual and obvious perils attendant upon his position; such as, for instance, the danger of being thrown from the platform by the jolting or swaying of the car.

In elaboration upon the first point it makes, the court says that riding upon the platforms of street railway cars is too much encouraged by transportation companies, and too much indulged in by the public, for the court to say, as a matter of law, that the mere riding upon the platform of such a car is conclusive evidence of negligence, or is negligence per se (in and of itself), or is negligence in law. It depends upon too many other circumstances and conditions for a court to lay down any hard and fast rule in regard to it; but it is a fact which should ordinarily be submitted to the jury, in connection with all of the other circumstances of the case.

That this is true with respect to horse street cars has been frequently decided. And the court does not think that the rule laid down generally with respect to trains of cars upon steam railroads should be the one to be applied to electric cars. It is a notorious fact, it repeats, in stronger language than above used, that street railway companies whose cars are propelled by electricity constantly accept and invite passengers to ride upon the platforms of their cars when there is no room inside, and that persons having occasion to use such cars are frequently glad for even a foot hold upon the platform, step, or footboard. Neither carrier nor public have regarded the street car platform as a known place of danger, so that this court is not disposed to say, as a matter of law, that a passenger who rides upon the platform of an electric street car is thereby guilty of such contributory negligence as to prevent his recovery for injuries sustained through the fault of an employe of the transportation company.

It holds, rather, as before intimated, that it is a circumstance to be submitted to and decided by the jury.

#### When Car and Cart Are Proceeding Side by Side.

*Rombach v. Crescent City Railway Company (La.)*, 23 So. Rep., 604, May 2, 1898.

In an action for damages received from a collision between a street car and a cart, moving side by side in the same course, with a narrow space between them, the supreme court of Louisiana reasons that one could not strike the other if each remained in its direction, and, it being evident that the car did not turn, but that the cart was turned so that it struck the side of the car, the presumption of negligence was not against the street car. To the contrary, it holds that if the driver of the cart pulled toward the car, even a very small distance, but enough to turn the cart diagonally to the car and bring the end in contact with the car, the cart would be the offending force, and not the car, following a direct line. Nor would the limited space between the two at the moment of the accident change the principle which should govern.

In all cases when the cartman deviates and departs from the track, and his cart and the car are running advancing side by side, he is presumably negligent if he chooses to turn his cart so as to strike the car, and this whether the tumbrel of his cart be short or long. After the cart is no longer in the car's range, a turn of its wheels gives rise to the unavoidable inference that the collision came from the cart's change in direction.

While it is true that street railway companies have not a monopoly of their tracks, and that they are not in their absolute use to the exclusion of vehicles, yet, the court adds, in order to hold them for damages their negligence must be proved. And it says that beyond all question, if a cart and horse were being driven on the rails, and the car people did not give it ample time to move out of the way, the company would be responsible in damages for the injury caused thereby.

#### Presumption of Negligence in Collision of Cars.

*Kay v. Metropolitan Street Railway Company (N. Y.)*, 51 N. Y. Supp., 724, May 13, 1898.

An accident out of which injuries arose for which a jury awarded \$6,000 damages took place at a terminal point of the road, upon a descending grade, at the foot of which was another car, being shifted from one track to another. The car in which the passenger was who was injured collided with it. It was shown in evidence that it was a stormy day and that the ground and track were covered with snow, to what extent being in dispute. Upon that state of the case, the trial court, on a motion for a non-suit, ruled that the circumstances disclosed by the testimony were such as to place upon the company the burden of showing that the collision was not due to any want of care on the part of its servants.

Such an occurrence at such a point in the road, was regarded, and, the first appellate division of the supreme court of New York holds, in affirmance of the judgment below, was, in and of itself, of such a character as to justify the inference of negligence, without any further proof than that of the situation and the occurrence itself. In other words, it maintains that the circumstances attendant upon the accident in question were of so unusual a character as to bring them within that maxim of the law which declares that negligence is imputable from the mere happening of the accident itself. The passenger, it says, was entitled to that protection which a carrier of passengers is bound to afford, not only in the management of the vehicle, but in the care of the tracks and appurtenances of the railway.

In a concurring opinion, Mr. Justice Ingraham says that the duty of the company to operate its road so as safely to carry its passengers consisted, not only of properly managing the car upon which this passenger was, but also in keeping the track in front of the car clear, so that no collision would occur, and if the company negligently allowed one of its other cars to remain upon the track which rendered a collision with this car, when properly managed, unavoidable, the negligence necessary to maintain the action was established.

Two of the justices of the appellate court dissent, but apparently only to the holding that it was not error to instruct the jury that under such circumstances the law imposes upon the company the burden of showing to the jury such facts as warrant the jury in concluding that the company exercised due care in the construction of its road and in the management of its cars and horses to prevent accidents, this being deemed tantamount to holding that the burden of proof was upon the company to establish a negative, viz.: that its servants were not negligent, a shifting of the burden of proof, which Mr. Justice McLaughlin said he did not think could be cured by other charges properly stating that the burden of proof rested on the party suing.

#### As to the Simple Term "Railroad" or "Railway," Including Street Railways.

*Massachusetts Loan & Trust Company v. Hamilton (U. S. C. C. A.)*, 88 Fed. Rep., 588, May 3, 1898.

But little is gained by a reference solely to the meaning of the word "railroad." The word, of itself, has no such fixed definition as to enable the court to determine whether, by its mere use in a statute, it applies to street railways or not. It may or not include them. It may be used in the statute in its broadest sense, or it may be used in its technical or popular sense. In its broadest sense, it undoubtedly includes a street railroad and every other kind of a road on which rails of iron are laid for the wheels of cars to run upon, whether propelled by steam, electricity, horse, or other power, carrying light or heavy loads of freight or passengers, or both. In its technical sense it does not apply to street railroads. So says the United States circuit court of appeals for the ninth district, which goes on to state that, following the established rules of construction, the courts have, in many instances, held that the word "railroad" does, in certain statutes, include street as well as steam railroads,



and in others that it refers only to the railroads of commerce. No particular stress should be given to the difference in the motive power of the respective roads. The difference between street railroads and railroads of commerce for general traffic consists in their use, and not in their motive power.

A railroad, the rails of which are laid to conform to the grade and surface of the street, and which is otherwise constructed so that the public is not excluded from any part of the street as a public way; which runs at a moderate rate of speed, compared to the speed of traffic railroads; which carries no freight, but only passengers from one part of a thickly populated district to another, in a town or city and its suburbs, and for that purpose runs its cars at short intervals, stopping at the street crossings to receive and discharge its passengers—is a street railroad, whether the cars are propelled by animal or mechanical power.

The railroads of commerce derive their powers from, and are governed by, national or state legislation. The street railways are generally regulated and controlled, principally, by municipal laws.

The words "railroad" and "railway" are synonymous, and, under all ordinary circumstances, they are to be treated as without distinction in meaning.

This was all brought out by the question presented, whether a judgment for \$7,500, with costs, against the Great Falls Street Railway Company, for personal injuries, was a prior and superior claim and lien, upon the property of the street railway company, to the mortgage lien and claim of the Massachusetts Loan & Trust Company, under the provision of section 707 of the fifth division of the Compiled Statutes of Montana, of 1887, that "a judgment against any railway corporation for any injury \* \* \* shall be a lien \* \* \* on the property of such corporation, and such lien shall be prior and superior to the lien of any mortgage or trust deed provided for in this act."

But the court is of the opinion that the act in which this section is found, was intended, in all of its provisions, to apply only to the railroads of commerce, and that the provision above quoted is not applicable to street railways, wherefore it orders the bill against the loan and trust company dismissed.

#### Right to Contract for Use of Other Roads Is a Property Right.

*Roddy v. Brooklyn City & Newton Railroad Company (N. Y.), 52 N. Y. Supp., 1025. July 11, 1898.*

By the terms of chapter 218, of New York Laws of 1839, it was made lawful "for any railroad corporation to contract with any other railroad corporation for the use of their respective roads, and thereafter to use the same in such manner as may be prescribed in such contract." This, the second appellate division of the supreme court of New York thinks was quite as necessary a provision for street surface roads as for railroads operated by steam, and that no sound reason can be advanced why it should not be considered as applicable to both classes of roads. It further says that the plain language of the right thus conferred did not require for its enjoyment the consent of the municipality or of the property owners upon the street; its exercise rested alone upon the ability of the corporation to reach an agreement, and carry that agreement into effect. And it holds that the rights thus reserved to street railway companies organized while that law was in force vested in them a property right, which could not thereafter be taken away or impaired, either by legislative enactment or constitution change, except in the proper exercise of the right of eminent domain and of the police power. The contention that the act was permissive only, and that therefore no vested right could be obtained, it adds, cannot be sustained. The court further states that while the act of 1839 is now repealed its provisions are essentially embodied in section 78 of the railroad law. It also takes particular pains to state that it is not to be understood as deciding that the legislature has no right, in the exercise of the police power, to regulate the number of cars which may be operated upon the street; but that the exercise of such power is applicable equally to the corporation owning the tracks, in the operation of its cars, as to the company contracting for its use. In other words, the

company has the right to operate as many cars as the law permits, whether its own or belonging to other companies.

#### Rule as to Care Required Not Changed.

*Koehne v. New York & Queens County Railway Company (N. Y.), 52 N. Y. Supp., 1088. July 23, 1898; Stierlev. Union Railway Company of New York City (N. Y.), 50 N. E. Rep., 834. June 14, 1898.*

There is no doubt, says the second appellate division of the supreme court of New York, in the Koehne case, that the first opinion of the court of appeals in Stierlev. Union Railway Company, which was reported on page 568 of the STREET RAILWAY REVIEW for August, gave rise to a very general impression in the legal profession that the rule imposing the highest degree of care upon common carriers for the protection of their passengers had been limited in its application so as to confine it to the maintenance of the roadbed, engines, cars, and other appliances of a railway corporation, and that it was not to be applied to the conduct of the agents and servants of the corporation in the operation of the road. This much, by way of explanation. That this view of the decision was erroneous, has been made plain by the court of appeals itself, in an opinion delivered upon a motion for a reargument.

In its second opinion, which is covered by the second of the above furnished references, the court of appeals of New York expressly declares that there is nothing in its former decision changing the rule of care applicable to the carrier of passengers, and that it has not changed the rule, but that it simply pointed out what was the proper rule under the issue and the circumstances disclosed by the record in this case.

The court tries to make its decision clear by explaining that, in the opinion first handed down, it was attempted to be shown that, under the particular circumstances of the case, the charge made at the request of the plaintiff, that a railroad company is bound to exercise all the care and skill which human prudence and foresight can suggest to secure the safety of its passengers, while correct in some cases, in this case might well have misled the jury into the belief that such was the rule of responsibility applicable here, while the application of such a strict rule under the facts of this case would have been quite unjustifiable.

In this case, the court goes on to say, there was no situation of danger and the accident occurred, whether under the plaintiff's or the defendant's theory of its occurrence, while the driver was simply changing his car from one track to another, over a switch, in order to cross a bridge. In so doing the duty imposed upon the defendant by the law was that of exercising reasonable care, or such care as an ordinarily careful and prudent man would have exercised under the circumstances, and that instructions had been, in fact and very correctly, given by the trial judge in his main charge.

The strict rule, embodied in the plaintiff's subsequent request to charge the court adds, would be proper in a case where the accident resulted from a situation from which grave injury might be expected, and which therefore imposed upon the carrier's servants the duty to exercise the utmost skill and foresight to avoid it.

#### Kinetic Motor is Not "Locomotive Steam Power."

*People ex rel. Babylon Railroad v. Board of Railroad Commissioners of the State of New York (N. Y.), 52 N. Y. Supp., 908. July 6, 1898.*

The relator in this case, as it is termed, in legal phraseology, is a street surface railroad company incorporated by special act to construct, maintain and operate a railroad through the streets of the village of Babylon, L. I., and to operate the same "by horses, mules, or dummy engines." It constructed its railroad, and operated it by horse power. In September, 1897, having obtained the consent of the owners of one-half of the property bounded upon its line of railroad, it applied to the state board of railroad commissioners for the approval by the board of a change of its motive power from horse to the "kinetic motor."

After a hearing duly had, and evidence taken, the board refused its consent, assigning two grounds therefor: (1) That the kinetic motor is "a locomotive steam power," and its use prohibited by section 100 of the railroad law. (2) It did not appear from the testimony "that the system has been demonstrated to be a practical or practicable one; on the contrary, it is wholly in its experimental stages;" and that the relator "is controlled by persons interested in this motor system."

After suggesting that, in view of the power which the state constitution reserves to the legislature to alter or repeal statutes creating corporations, the suggestion that the special act creating this corporation, and its acceptance of the conditions, created a contract, is not well founded, the third appellate division of the supreme court of New York says that it thinks, however, that the kinetic motor referred to is not the "locomotive steam power" contemplated by the statute, and that, when the board of railroad commissioners decided that the statutes forbade them to give their approval, they misconceived the law. And because the company had the right to have its application considered free from such misconception, the court holds that the determination should be reversed.

Nor does the court think that the statute requires the board to withhold its approval because the motor is still in its experimental stages, or because the company is controlled by persons interested in this motor system. Unless the rights or safety of the public or of its members are exposed to danger, the court declares, it is not unreasonable to tolerate experiments having for their object private gain through a new means of public benefit.

#### Cable Cars Appearing in Sight Do Not Prevent Crossing of Tracks.

*Kennedy v. Third Avenue Railway Company (N. Y.), 52 N. Y. Supp., 551. June 24, 1898.*

The first appellate division of the supreme court of New York remarks, with a fine touch of sarcasm, that pedestrians and vehicles have some rights which even cable cars are bound to respect. It says that they have a right to cross the street, even though a cable car may be in sight. If not, then the city would be divided into as many zones as there are lines of power cars running the length of the island, and nobody could ever get across.

Referring to the case before it, where damages were sought for personal injuries caused by a cable car running into a wagon, the court says that it was not incumbent upon the driver of this vehicle to wait until no cable car was in sight before he attempted to cross. He had a right to cross the track when there was a reasonable opportunity so to do, even though it required the cable car to slacken its speed in order that it might not upset his vehicle.

The rights of drivers of vehicles and of cable cars are reciprocal, and the gripman of a cable car is bound, continues the court, to use as much diligence to avoid running into a vehicle which is crossing its track as the driver of the vehicle is to avoid running into a cable car which may be crossing its path.

It seemed to be assumed in this case, upon the part of the cable car company, that, unless a vehicle can certainly entirely clear a cable car approaching at a high rate of speed, its driver has no right to attempt to cross, and that the car is in no case bound to slacken its speed. But the court declares that it knows of no such rule of the road.

Here it was evident that the gripman had time enough to stop his car after he had seen the plaintiff attempting to cross the track, and before he collided with him, and the court says that the plaintiff had a right to suppose, when he went upon the track, that the gripman would give him the ordinary rights which one vehicle owes to another. Instead of that, it says, the gripman evidently did not attempt to stop his car until he saw that a collision was inevitable, when he used all his power, but it was too late.

Under these circumstances, the court holds that it was a clear case to submit to the jury, and that there was ample evidence of negligence upon the part of the gripman in the management of his car, wherefore, it affirms a judgment against the street railway company and an order denying the latter a new trial.

#### Liability for Injury to Boy Permitted to Turn Trolley.

*Pueblo Electric Street Railway Company v. Sherman (Colo.), 53 Pac. Rep., 322. May 16, 1898.*

A boy 13 years old, having been permitted by the motorman to ride with him on an electric car, alighted from the front platform, while the car was in motion, turning the trolley at the end of the runs. Finally, he was injured, and an action was brought for damages.

The proximate cause of the injury was considered to be the boy's act in voluntarily alighting from the car while in motion, and, were it not for his age, the supreme court of Colorado says, it would be unnecessary to pursue the inquiry, because in the case of an adult, of that age and experience when he would be presumed to be able to comprehend the consequences of his acts, alighting from a car under similar circumstances, and being thrown down and injured, would constitute contributory negligence, and preclude any recovery for the damages thus sustained.

But the boy being still of that age when the instincts of childhood easily dominate, the court thinks that it was proper, taking into consideration all of the attendant circumstances, to submit to the jury the question of whether or not he was responsible in alighting from the car while in motion, or exercised that degree of care and caution in so doing which would be required and expected of him under the circumstances.

Turning to the question of whether or not the company was guilty of negligence in permitting the boy, through its motorman, to ride upon the car and alight therefrom when in motion, without any effort to restrain him from such acts, the court proceeds upon the theory that whatever is done by the servant, in the course of his employment, the master is liable for, whether such act be one of omission or commission.

The motorman was charged with the management and control of the car. It was his special duty, regardless of instructions, to exercise reasonable care and diligence in operating it, so as to prevent injury to those with whom the relation of carrier and passenger did not exist.

To allow children to make a playground of a moving street car, or convert that vehicle, when so moving, into an article of amusement, continues the court, is certainly exposing them to serious, if not fatal, injuries; and it is as much the duty of the employees of a street car company to exercise reasonable care and diligence in preventing those not capable of appreciating the danger to which they would be exposed on account of their childish proclivities to amuse themselves in the manner this boy did, as it is their duty to prevent injury to persons of like age exposed to injuries in other ways from the same source.

Thus, the court holds the company guilty of negligence in its failure to use ordinary care to prevent the boy indulging his childish instincts, and so expose himself to the means of danger which resulted in his injury.

On the other hand, it suggests that the boy was old enough so that if, after being informed of the danger, he still chose to voluntarily incur the danger, he should be held responsible for his want of care in that respect.

#### Responsibility for Attempt to Board Car While in Motion.

*Savage v. Third Avenue Railroad Company (N. Y.), 51 N. Y. Supp., 1,066. May 20, 1898.*

After holding that, if the street car in question did not stop to enable the person awaiting it to get upon it so that the street railway company tacitly invited him to board the car, there could be no negligence imputed to the company because the car continued in motion after he attempted to get upon it, the first appellate division of the supreme court of New York explains that when one seeks to become a passenger upon a railway car, he has the right to insist that the car shall come to a stop, to enable him to do so; but, if the car does not come to a stop, the railway company is not at fault if he attempts to board the car while it is in motion, unless it shall appear that, having diminished its speed so much as to constitute a tacit invitation to him to become a passenger, the speed is accelerated suddenly, without notice, while he is in the act of getting upon the car in pursuance of the tacit invitation.



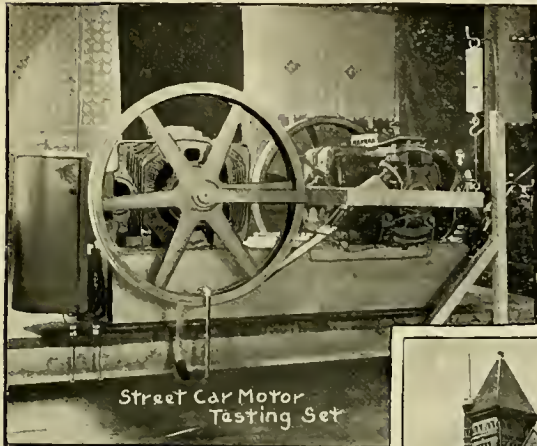
## ELECTRICAL ENGINEERING AT PURDUE.

Purdue University, at LaFayette, Ind., is the state school of technology. Within the past decade, under the able management of President James H. Smart, it has made rapid progress and is now one of the leading engineering colleges in the country. The university is divided into five distinct schools, viz., civil, mechanical, and electrical engineering, science and agriculture, each school being provided with a separate faculty and well appointed laboratories.

The purely electrical work is confined to one building which is a handsome structure of brick with stone trimmings. It includes the offices, recitation and lecture rooms, work shop, drawing rooms and the electrical and physical laboratories. After three years' study of the fundamental engineering subjects, including work in the foundry, pattern, machine and blacksmith shops, the

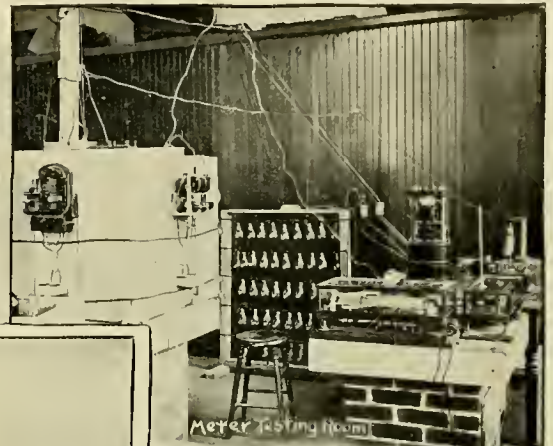
needed by overhead circuits to a general switchboard having 472 connections. The lines are numbered at each end and labeled at the switchboard. To provide a load for the dynamos there are two resistance boards; one a lamp board having 204 16-candle power incandescent lamps, the resistance ranging from one to 40,000 ohms, and a board of 250 German silver coils which can readily be connected to give any resistance from .08 to 1,250 ohms.

Of the direct current machines there are the arc and incandescent dynamos, series, shunt and compound wound motors and generators and street railway motors. There are two railway motors with the rheostats and connections. The gears have been removed and cast iron brake wheels are mounted directly on the motor shafts. The rim of each of these wheels is pierced with 12 holes, and brake bands of cotton belting surround them. As the motors are speeded up oil and water are run into the inside of the

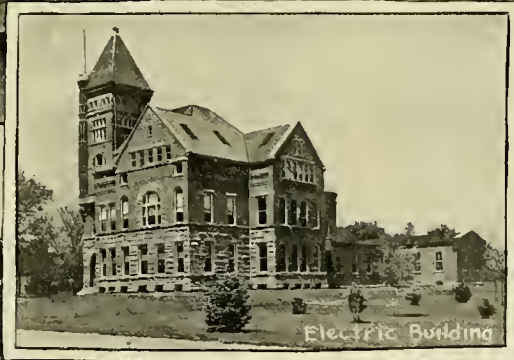


Street Car Motor Testing Set

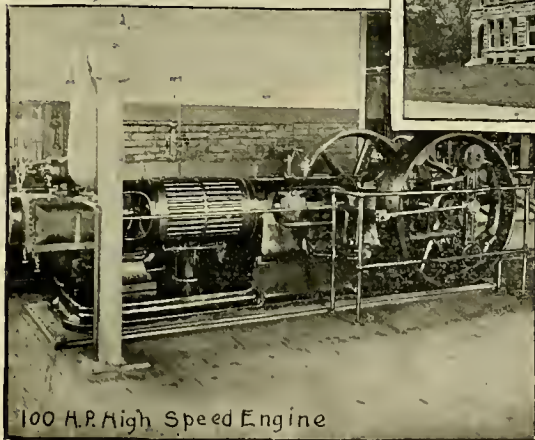
Electrical  
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University



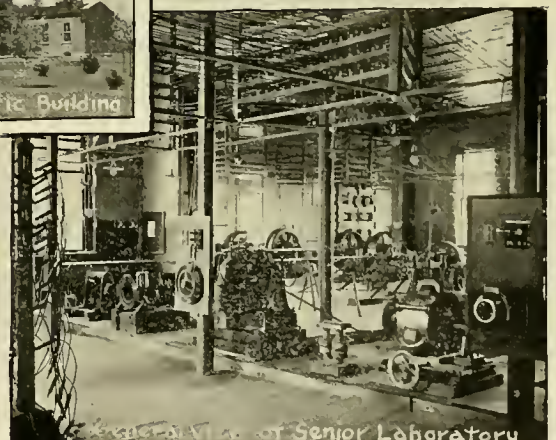
Meter Testing Room



Electric Building



100 H.P. High Speed Engine



General View of Senior Laboratory

senior students get a thorough training in the electrical laboratory, which is admirably equipped for carrying on nearly every line of experimental work.

The laboratory is a large room having a floor space of 1,000 sq. ft., and containing 20 dynamos and motors of 11 different makes and 15 different types. The prime mover is a 100-h. p., non-condensing, tandem compound McEwen engine, operating at 300 r. p. m., with a speed regulation of one-third of one per cent. This is belted to a 3-in. line shaft in three sections, which is in the basement. The laboratory machines are on two piers and each dynamo is belted to a friction clutch pulley on the line shaft, permitting any combination of machines to operate at one time and giving the greatest possible flexibility.

All the machines and instruments in the laboratory are con-

necting to a general switchboard having 472 connections. The lines are numbered at each end and labeled at the switchboard. To provide a load for the dynamos there are two resistance boards; one a lamp board having 204 16-candle power incandescent lamps, the resistance ranging from one to 40,000 ohms, and a board of 250 German silver coils which can readily be connected to give any resistance from .08 to 1,250 ohms.

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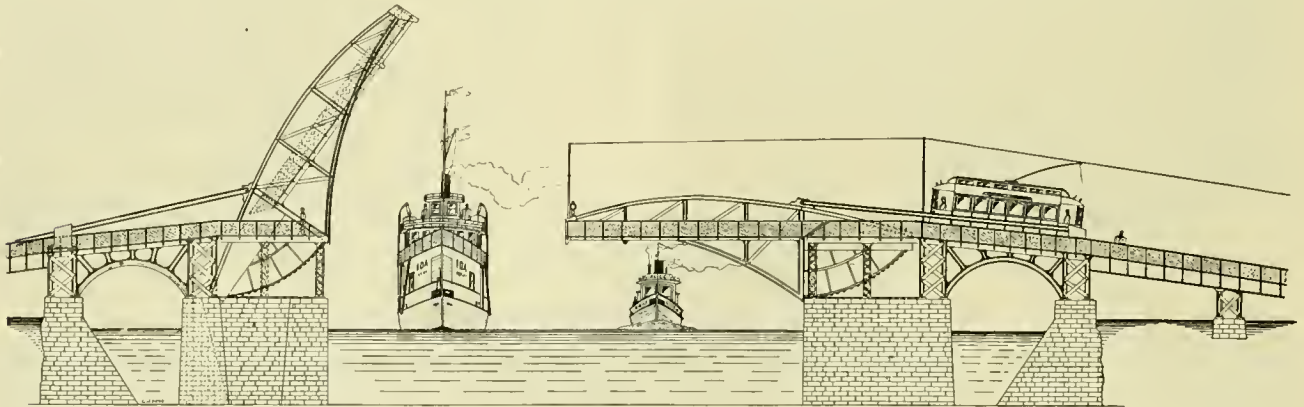
meter room is fitted for testing and standardizing incandescent lamps and testing arc lamps on a commercial scale.

There is a complete equipment of both single and multiphase alternating current apparatus including 17 transformers. The latest addition consists of a new 50-k. w. alternator specially designed to give either single, two or three phase currents or a monocyclic adjustment. In addition to all this the laboratory is fitted with all kinds of testing and measuring instruments needed in experimental work. Each senior student prepares a thesis. This may be on a purely theoretical subject, or the building of a piece of apparatus which is added to the laboratory equipment or in testing some plant. This last year the power station of the LaFayette Street Railway received a thorough test.

The department is under the direction of W. Elwell Goldsborough, professor of electrical engineering, to whom great credit is due for bringing the course to its present high standard. Associated with him are A. Wilmer Duff, professor of physics; C. P. Mathews, associate professor of electrical engineering, and instructors E. E. Reynolds, W. N. Motter, J. W. Esterline, S. N. Taylor and H. G. Creelman.

### LIFT BRIDGE NEAR MONTREAL.

The city of Montreal is joined on the west by the town of St. Paul, Atwater avenue being the dividing line; immediately across the Lachine canal, on the north side are St. Henry op-



ROLLING LIFT BRIDGE DESIGNED BY FRANCOIS LAPOINTE.

posite St. Paul and Ste. Cnnigonde opposite Montreal, the two being divided by an extension of Atwater avenue. A bridge at this point has long been desired, the nearest bridge being over a mile east of Atwater avenue, making a long detour necessary to travel between St. Henry and St. Paul. The municipalities interested have sent an imposing deputation to Ottawa to lay the question of a new bridge before the ministry and it is understood that the Dominion Parliament will act on the matter at the coming session.

As the bridge is to be used by several street car lines as well as for general foot and vehicle traffic, and the canal traffic is heavy, a type is desired which can be manipulated quickly.

The councils of the several municipalities have accepted and strongly recommend the plans submitted by Francois Lapointe, a Canadian architect and engineer, now of Chicago. The accompanying illustration shows the general arrangement in elevation. The canal is 215 ft. wide and the bridge is to be 220 ft. long with an opening span of 100 ft. The width over all is 46 ft. There are two street railway tracks laid in the middle of the roadway and two foot-ways outside the trusses. The height above the water is 18 ft.

As is seen, it is of the rolling lift type, raised and lowered by steel cables to be operated by 50-h. p. electric motors. The time required for opening or closing the bridge is ten seconds. A hand lever is provided for emergencies.

Aluminum wires as conductors are receiving attention. A transmission line to Seattle, Wash., is to be of four aluminum wires.

### MECHANICAL TRACTION IN PARIS.

At the present time there are in service in Paris 211 cars operated by mechanical, and 478 cars operated by animal traction. There are no less than nine different systems of mechanical traction used in propelling the rather limited number of cars; Rowan motors (1889); Franeq system of hot water motors (1889); cable system (1891); Serpollet motors (1892); slow charging accumulators (1893); compressed air motors (1896); rapid charging accumulators (1897); perfected Serpollet system (1897). The mileage is thus divided; mechanical, 55 miles; animal, 130 miles.

The Tramway Company of Paris and the Department of the Seine is about to equip its system with double truck cars operated by rapid charge accumulators, Thomson-Houston system. The General Parisian Tramway Company is to establish an overhead trolley line from the Bastille to Charenton. The General Omnibus Company has made application for authority to equip 16 of its line for mechanical traction.

### PROSPEROUS AUSTRALIAN COMPANY.

We have received the 25th annual report of the directors of the Melbourne Tramway & Omnibus Company which was submitted to the stockholders at their regular meeting on August 16, last. It shows an income for the fiscal year ending June 30, 1898, of

£378,632, nearly all from traffic receipts, and expenses of £350,397 (which includes over £76,000 interest charges and £47,000 carried to sinking fund and renewal reserve account) leaving profits for the year of £28,235. A dividend of 2½ per cent on the amount of the capital stock paid in was declared in January last and a similar dividend proposed for July making the dividends for the year £24,000. The amount carried to the surplus is £4,235 making the total to carry forward, £28,474. The company operates 48 miles of double track, of which 43½ miles are cable.

The passengers carried were: By omnibus lines, 596,836, or 5,172 less than last year; by tramway lines, 36,245,280, or 1,470,503 more than last year. Or a grand total of 36,842,166, or 1,465,331 more than in 1897. The miles run by omnibus and cars were: By omnibuses, 277,961, or 152 more than last year; by tramcars, 7,983,852, or 144,552 more than last year. Or a total of 8,261,813, or 144,704 more than in 1897.

F. B. Clapp is chairman of the board of directors and managing director of the company, and W. G. Spring is secretary.

We note in a Melbourne paper that in presenting the report to the stockholders, Mr. Clapp made the following remarks concerning pleasure traffic: "Speaking of the operations of the company generally, I may say that the only change of moment in the working of the lines was that made in December last, when the large and increasing traffic to the St. Kilda Esplanade and beach was further accommodated by the running of cars through to Melbourne, instead of transferring passengers at St. Kilda Junction to a local line. This change has been much appreciated, and a great convenience to the traveling public."



**STREET RAILWAY TRAFFIC IN NEW ORLEANS.**

The city of New Orleans is exceptionally well served by the five companies which control its street railways, and the good service and improvements made in recent years have resulted in an increase in the number of passengers carried from 26,340,000 in 1887, to 43,037,000 in 1897. The data as to passengers carried and the cost of extensions and improvements in 1897 are as follows:

Total number of passengers carried.....	43,037,601
Total number of police carried free.....	254,920
Total number of firemen carried free.....	221,500
Total number of Sisters of Charity carried free.....	276,250
Total amount taxes, city, state, and in licenses.....	\$168,900.65
Total amount spent in street repairs.....	\$70,612.26
Total extent of new track (miles).....	8 5/8
Total cost of new track.....	\$130,040 00
Total number of men employed.....	2,620
Total number of new cars.....	24
Total cost of new cars.....	\$72,100

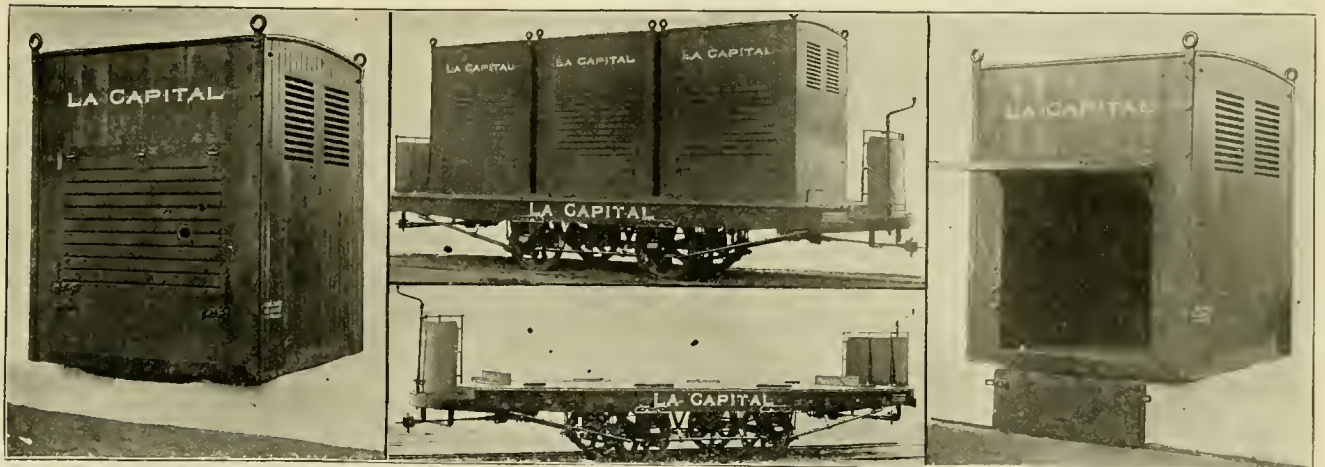
A local paper, speaking of the railways of New Orleans says: "Within the past few months electricity has supplanted steam to

**MEAT CARS IN BUENOS AIRES.**

An order, recently placed in Philadelphia from Buenos Aires for meat boxes, trail cars and motor meat cars, upwards of 350 in all, shows that in the modes of handling and distributing meat the cities of South America are far in advance of any city or town in the United States.

The slaughter of cattle there is entirely in the hands of the government which owns and carries on the abattoirs. No slaughtering is permitted outside of the established slaughter houses. This at once puts the character of the animals used for food within the control of the authorities. Immature or diseased animals cannot therefore be used for food. The abattoirs are located 14 miles from the city and they not only prepare all the meat used at home but that which is exported in cold storage.

The plans for the distribution of the dressed meat to markets and butcher shops are exceedingly interesting and savor largely of the Yankee in directness and simplicity and in the adaptation of means to ends. It is at this point they call upon the American for assistance. An electric railway of the city has a contract for the transportation of meat and has special cars constructed so that it can distribute it to all the markets, butcher shops and cold storage houses where it is delivered for shipment to steamers. The system is not altogether new and was in



BRILL MEAT CARS AND BOXES, BUENOS AIRES.

the lake. In this two radical advantages of the utmost importance to the lake resort have been gained. Possibly the minor of the two—important as it is—is the reduction of time which is gained, the electric cars being very much faster than the old-time dummy trains. But the more important consideration is the fact that the factor of annoying cinders which has in the past so militated against the pleasure of this splendid ride has been eliminated from the problem.

"Railway facilities to the great down-town park, City Park, have been very much increased by the direct extension of the Orleans line over Bayou St. John to the entrance gate of the park. Now the park is reached directly by two routes instead of the one by Esplanade avenue, and as the two lines intersect entirely different portions of the city the addition to the service is all the more important."

The New Orleans street railway companies are the Canal & Claiborne, Joseph H. De Grange, president; the Orleans, Emilien Perrin, president; the New Orleans Traction Company, R. M. Walmsley, vice-president, and C. D. Wynan, general manager; the St. Charles, Alden McLellan, president; the New Orleans & Carrollton, J. K. Newman, president.

The Birmingham (Ala.) Railway & Electric Company is now engaged in the reconstruction of its lines.

operation on a smaller scale and with more limited facilities on the old horse car lines. As long ago as 1885 the J. G. Brill Company, of Philadelphia, built special meat cars for the street railway companies of Buenos Aires, Santiago, Montevideo and other South American cities.

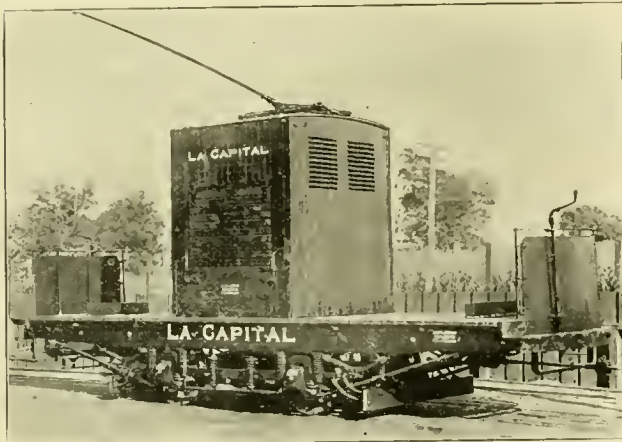
The old style cars were drawn by horses and were of necessity small and carried light loads. The carcasses were carried to the car and hung up inside and then hauled to the city. At each point where meat was required the car was stopped and the desired number of quarters taken down by hand and carried into the market, and the car then continued its journey. This method of handling meat was slow and very laborious and involved a certain amount of unnecessary exposure.

With the introduction of electric traction in the place of animal power the system is being greatly improved and the facilities for handling increased while the exposure of the meat in transit is almost nothing. By the new order of things the sides of meat are placed in so-called meat boxes, which are set upon a flat car and are thus taken to the markets without exposure. Upon arrival a powerful crane at the curb lifts each box from the car and deposits it upon a large three wheeled hand car upon which it is taken directly into the ice box. The flat car then goes on to other points of distribution.

The accompanying illustrations show the meat boxes, the flat cars and the flats when loaded, and give a clear idea of the

method by which the service is accomplished. The meat boxes are 5 ft. 11 in. square outside and 7 ft. 3 in. high, with double sides and are lined with zinc. There are slat ventilators in the two sides and in the doors. The latter lift upward into a horizontal position when open. To economize space in front that part of the side which is below the door lifts out instead of being made to swing. Inside the boxes are fitted with pipe racks in the center, along the sides and stationary racks in the roof all of which are provided with sliding hooks for meat. Each corner of the box is furnished with a heavy iron strap terminating at the top in a strong eye. These eyes are for the hooks of the lifting cranes and the boxes are in this way as easily handled as a barrel or a bag.

The boxes have capacity for 6,000 lbs. of meat and the total weight of each box loaded is 7,750 lbs. When taken from the flat cars they are set upon small but very strongly built three



BRILL MOTOR CAR FOR MEAT SERVICE.

wheel hand cars. The platforms of these hand cars are 5 ft. 11 in. square, very strongly built of I-beams and are mounted upon broad faced wheels 12 in. in diameter. The axles are fixed with the wheels loose upon them revolving in roller bearings to diminish as much as possible the labor of hauling.

Two styles of cars are used for carrying the boxes, motors and trailers. The trailer is intended to be attached to a passenger car or to a special motor car. These cars weigh 6,820 lbs. and when loaded with three full boxes they weigh 30,070 lbs. There are 75 cars of this class.

Twenty cars are mounted upon Brill No. 21E trucks, the trucks and motors weighing 8,600 pounds. These motor cars are used for hauling the trailers as well as carrying a load. They differ from the other cars in having the central box stationary, its top being used for supporting the trolley board and pole.

It is evident from the number of cars and boxes that the service is an extensive one and is intended to facilitate a large export trade. While making a profit out of this service the tramway company becomes a public benefactor in substituting a rapidly moving trolley service for the heavy lumbering meat wagon with which all large American towns and cities are afflicted. And here a question arises as to the possibility of utilizing the trolley and the street railway tracks as a means of doing all the heavy trucking in our large cities. The loads carried by these cars, amounting to more than 23,000 pounds, is as great as that ever placed on any except the heaviest trucks and these are rarely met. The capacity is certainly ample and in other respects the service appears equally feasible.

Press reports state that the Brooklyn Rapid Transit Company, which controls the Brooklyn Heights, the Brooklyn City, the Brooklyn, Queen's County & Suburban, the Sea Beach, the Sea View and the Long Island Traction roads, has acquired control of a majority of the stock of the Nassau Electric Railroad Company.

## PRESENT STATUS OF ELECTRICAL ENGINEERING.

Inaugural Address of President A. E. Kennelly before the American Institute of Electrical Engineers.

While mechanical engineering may be said to have an antiquity coeval with civilization, its latest offshoot, electrical engineering, only came into existence with the advent of the electric telegraph some 60 years ago. For the greater part of this time electrical development was confined to the telegraphic industry, but with the extended introduction of the arc and incandescent lamps, the utilization of the magnetic properties of iron and steel made rapid progress in dynamo construction, so that the magnetic properties of steel now play almost as important a part in the advance of civilization as do their mechanical properties.

By far the greater proportion of electrical development has come within the last decade and a half. Looking back from the Trans-Mississippi Exposition at Omaha of today to the International Electrical Exhibition of Philadelphia in 1884, the birthplace of the American Institute of Electrical Engineers, it is doubtful whether outside of telegraphy and telephony there was at that time in the United States a total investment of \$1,000,000 in electrical applications. The words ammeter and voltmeter were just commencing to be generally recognized, and of electric traction there was none. At the present time the capitalization in electrical applications in the United States is estimated at about \$1,900,000,000.

In 1884 a 50-k. w. dynamo was considered a large machine, while a 100-k. w. Edison steam dynamo was justly called a "Jumbo." At the present time the largest size of generator built or building is of 4,600-k. w. capacity. The price of dynamos in 1882 was about 20 cents per watt of output, while dynamos of similar running speed in comparatively small sizes without switchboards, now cost about two cents per watt. The great reduction in price represents the aggregated result of the very large amount of labor devoted to this branch of engineering in the last 15 years.

It is interesting to notice that the efficiencies of continuous-current dynamos have not made any marked nominal advance since the birth of the Institute, though their output per unit of mass has considerably increased. Thus the 50-k. w. dynamo tested at the Philadelphia Exhibition is stated to have had an efficiency of approximately 92 per cent, and this would be considered a satisfactory performance in that size of machine today. But, where the output then was only six watts per pound of net weight, the output of a machine of similar rating and speed today would be about 10 watts per pound. In other words, the efficiencies of the best dynamos of 1884 were already so good that it has not paid, at existing costs of power, to markedly improve them, and such improvements in material and design as have since been effected have enabled manufacturers to increase the rating or yield, and, therefore, the cheapness of the machines. It seems probable, moreover, that this will continue to be the direction of future progress. We scarcely can desire more efficient machines than the best we have now, but we shall always desire cheaper and more powerful machines, and shall welcome any improvements which lead to them.

Another evidence of the development in dynamo machinery is their improved appearance. Formerly, the only claim possessed by such apparatus was utility. More recently, grace, the expression of unconscious power, has supervened, and the modern dynamo is often pleasing to look upon as well as useful to operate.

The cost of generating a kilowatt-hour of electric energy from steam for electric lighting, appears to have been at least 7.5 cents at bus-bars in 1884. At the present time the cost of delivering a kilowatt-hour to large street railway systems from steam, is only about one cent, and the power house operating costs are reported in some cases as low as half a cent. In municipal electric-lighting systems supplied at low pressure from steam central stations and hampered by relatively heavy distributing expenses, the retail price of the kilowatt-hour varies from 20 to about 4½ cents, according to the locality and quantity consumed. Niagara power



is now sold to consumers in Buffalo at rates varying, according to the amount delivered, from two cents to slightly less than two-thirds of a cent per k. w. hour delivered.

The price of a 16-candle-power incandescent lamp 16 years ago was about \$1.00. Now it is about 18 cents. The best lamps at that time, under laboratory conditions, gave about 0.28 mean horizontal normal British candle power per watt, and under commercial conditions about 0.20. The highest pressure for which they could then be obtained was about 110 vol'ts. At the present time lamps are obtainable giving normally 0.4 mean horizontal British candles per watt, while under commercial conditions the average lamp normally develops about 0.25 candle per watt. They can also be obtained (at 0.25 candle per watt) for pressures up to 240 volts, and are frequently installed on 220-volt mains.

Arc lamps were already so far advanced in 1884, that comparatively little improvement in their effectiveness has taken place, the gain having been made in economy of operation. Thus, the carbons which cost at that time about six c. n's apiece, now cost about two cents apiece. The enclosed arc lamp has of recent years become popular owing to its diffused light and a carbon life of from 100 to 150 hours.

It has been estimated that about \$600,000,000 has been invested up to the present time in electric lighting stations and plants in the United States.

The best storage cells tested at the Philadelphia Exhibition of 1884 gave a yield, under laboratory conditions, of 3.425 watt-hours per pound of electrodes with an energy efficiency of 69.45 per cent when discharged at the mean current density of 12.42 amperes per sq. ft. of negative plate surface; while the deterioration was comparatively rapid. At the present time storage cells are in use giving under laboratory conditions, a yield of from 5 to 6 watt-hours per pound of charged cell (11.0 to 13.23 watt-hours per kilo), with an energy efficiency of about 85 per cent when discharged at a current density of 4.8 amperes per square foot of negative plate surface. There are now storage batteries installed in the United States to the aggregate capacity of about 56,000 kilowatt-hours. The largest installation has 166 cells, weighs 500 short tons and has an eight-hour discharge capacity of 22,400 ampere-hours, or 3136 k. w.-hours at 140 volts pressure.

A very great development has taken place in the direction of electric traction, by virtue of which, the horse car, once so well nigh ubiquitous in the city streets, has almost entirely disappeared, while electric locomotives of 1,500 h. p. have even made their appearance on steam railroad tracks. The introduction of soft cast steel has been very advantageous to the electric motor, enabling its output to be increased from five watts per pound of net weight in 1884, to about 14 watts per pound in street-car motors, at the present time. It is estimated that there are, today, in the United States, about 14,000 miles of electric railroad, with a nominal capital of about one billion dollars, and employing about 170,000 men.

The electric transmission of the power of falling water is a branch of engineering that has come into service since 1884, and is making rapid strides, owing to the recent successful employment of high voltages and multi-phase alternating currents. It has been estimated that about 150,000 k. w. of this class of machinery is installed in the North American continent, commercially transmitting power to various distances up to 85 miles, at various pressures up to 40,000 volts.

The alternating-current induction motor has become very popular in recent years, mainly owing to its powerful starting torque and its freedom from commutator and brushes. A burned-out armature, the perpetual source of dread in motor operations of days gone by, is practically unknown in this type of machine, even when put to severe service. Indeed its depreciation under fair conditions appears to be as low as in any class of rotating machinery.

The alternating-current transformer has been correspondingly improved, developing in large sizes, an efficiency of about 98.5 per cent, and an output, when cooled by external power, of about 100 watts per pound of weight.

The principal engineering value of electricity to-day lies in its adaptation to the transmission of power, through mills or cities,

or from some locality where power is cheap to another where it is dear. A steel rope, by its bodily motion, can transmit, with appreciable friction and depreciation, some hundreds of kilowatts to a distance of some thousands of feet. A bare incandescent copper rope, half an inch in diameter, and supported on poles, can, by maintaining an effective potential of 10,000 volts, by the motion of electric waves over its surface, transmit say 2,500 k. w. with an energy loss of two-thirds of one per cent per mile (0.4 per cent per kilometer), and with practically no depreciation except to the poles and supports.

The use of high pressure has thus become more frequent during the last few years. Alternating-current generators are now made to supply 10,000 volts at their terminals, and insulation-testing sets have been made for producing alternating pressures up to 100,000 volts effective.

The application of electric power to domestic use and household comforts, irrespective of illumination, has made steady progress. In the large cities, the fan-motor day load of summer is in the aggregate a perceptible quantity, while electric ranges and heaters on a small scale have found favor through their convenience.

In telegraphy, comparatively little change has recently taken place, beyond the substitution of the dynamo or dynamotor for the voltaic battery, and of copper line-wire with some five ohms per mile, for iron wire with some 13 ohms per mile. About one million miles of telegraph wire are now strung on some 200,000 miles of pole line in the United States, connecting about 25,000 offices and working a capitalization of about one hundred and fifty millions of dollars.

In the United States, the uniformity of the closed circuit Morse system simplex, duplex or quadruplex, is only varied by an occasional Wheatstone set. The crystallization of methods is not due to any lack of invention, or capability of improvement in signaling speed, but rather to the apparently settled belief that the present systems are the most economical under existing conditions of traffic. In long submarine telegraphy, the pressure of increasing traffic has made itself more distinctly felt, and automatic curb-senders have, to some extent, been introduced, but the physical difficulties in the way of attaining high speeds have as yet been obviated only in part by an increased expenditure in copper and gutta-percha, to obtain a diminished conductor resistance per mile. Wireless telegraphy has entered its experimental stage and bids fair to enter practical service in the future, at least within a limited range. Its public use thus far in the United States seems to have been limited to blowing up at stated intervals, in the recent New York Exhibition, miniature models of the "Maime," at a distance of some 25 metres from the oscillator.

In telephony, the most notable improvement in recent years has been the general substitution of metallic circuits for ground return circuits, with great advantage to the convenience and effectiveness of the traffic. At the present time conversation is carried on commercially up to a distance of 1,800 miles, and quite frequently at distances of 1,500 miles. There are at the present time in the United States about 1,000,000 telephones connected with the telephone service of the country, employing a capitalization of about \$100,000,000, with 400,000 stations and about 900,000 miles of wire. Every day about 17,000 employes make on an average more than 3,000,000 of connections. About 300,000 miles or nearly one-third of the total length of telephone wires have, within the last few years, been made up into aerial and subterranean cables within city limits, owing to the reduction of the electrostatic capacity effected in such cabled wires to less than one-twelfth of a microfarad per mile of single wire.

At no time has a useful discovery or improvement had more chance of welcome or application than at present. As an example, the case of Roentgen rays may be cited. Professor Roentgen's celebrated paper announcing the discovery of X-rays was read in Wurzburg in December, 1895, and the particulars were not known in the United States until early in 1896. In the same year (December, 1896) radiographs were accepted as legal evidence in a United States district court.

A considerable development has occurred in electro-thermic and electrolytic processes. More than 4,000 kilowatts of Niagara

power are now employed in such processes. Among electro-chemical processes are the electrolytic refining of copper to the extent of about 150,000 tons annually, the production of aluminum, the production of sodium and alkalis and the treatment of ores. Among electro-thermic processes are the production of the carbides of silicon and calcium in steadily increasing quantities.

In electrotechnical theory considerable advance has been made of recent years, particularly in the study of alternating currents. Accompanying the expansion of knowledge in the various branches there is a tendency to combine and unite them into one general theory. Thus, while the early dynamos generated a low-tension electricity which was once regarded as something so dissimilar to high tension electricity as to require separate treatment and classification, today the high-tensions derived from alternators through step-up transformers, so far invade the territory of so-called frictional electricity that a dividing line between the two classes can no longer be maintained. Similarly telephony and telegraphy are coming to be regarded as sub-classes of alternating current power transmission, while electricity and magnetism cannot properly be studied apart.

Although a large amount of electrical work is done in physical laboratories in the United States, a comparatively small amount of the results of this work becomes available to the science or art of electrical engineering. Each year sees more than a hundred students engaged in experimental thesis work after a laborious training and preparation for several years in the technical college. Many of these men have the time and facilities to do the best experimental work of their lives under the guidance of their instructors. Some of the men display aptitude and interest in some special line of research in which they would be best left untrammelled, but in most cases the experimental work under co-operative guidance could accomplish a great deal for the knowledge and progress of our branch of applied science. There are numerous questions concerning the various electro-magnetic properties of matter and of the ether that are of great and growing importance, and there are numerous scientific subjects of immediate practical importance that it is necessary to measure and observe, so that by uniting the available experimental resources of the various colleges in this country under a common leadership, in sympathy with the college instructors, the results which now largely fill thesis books lying on neglected shelves might be incorporated into permanent results for the general advancement of our profession. The plan would involve practically no expenditure beyond the voluntary efforts of those upon whom the duty devolved of formulating and dividing the subjects of research, and classifying or comparing the results attained. Such a system of co-operation among the students through their instructors would economize a large amount of the most skilled technical labor, and accelerate progress in all branches of inquiry, application, and industry. No better work could be undertaken by our Institute than the fostering of such an organization.

The technical progress of a profession like ours is shown by the precision of which it is capable. A loose nomenclature begets looseness of observation and description, and is inconsistent with a high degree of development in a science that quickens the footsteps of every human industry. The tendency of our machinery and definitions to become standardized is apparent in the impulse which has led the American Institute of Electrical Engineers to appoint a Committee on Standardization, the preliminary report of which is today laid before this Institute for consideration.

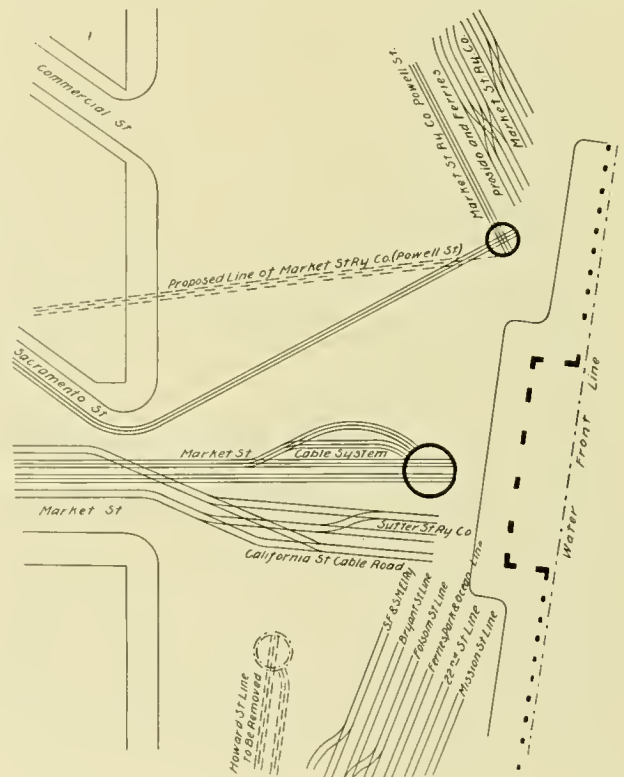
In connection with standardization it is important to observe that there has been of recent years a tendency to depart from the regular standards of dynamo machinery built by the manufacturers, in favor of special machinery built by the manufacturers, in favor of special machinery of independent design. To a limited extent this is, of course, necessary under the pressure of changing methods and conditions, but there is reason to believe that much more special machinery is built than necessity can warrant. Not only is the special machinery thus ordered or specified considerably more costly than standard machinery, but the tendency, by interfering with the natural shop methods of standardizing and cheapening production, prevents regular consumers from purchasing standard machinery at as low rates as would otherwise be possible. When we consider that the industrial radius of application of electricity mainly depends upon the first cost of the apparatus it employs, it needs no homily to drive home

the conviction that the unnecessary introduction of special machinery is a puncture in the tire of progress.

Our Institute may well take pride in the share which it has taken in the electric progress of the 14 years which have elapsed since its inception. It now numbers 1,100 members. Its purpose is to aid all who seek to acquaint themselves with this branch of science and art, and to set the stepping stones of progress in the sands of time for the advance of the industrial applications of electricity.

## FERRY TERMINALS IN SAN FRANCISCO.

The new ferry depot which is rapidly approaching completion at the foot of Market street in San Francisco, and the removal of the old sheds which have heretofore served that purpose will be available much needed space at this point and considerably relieve the traffic which is much congested at certain hours of the day. Some changes will be made in the arrangement of the street railway terminals. It is proposed to rebuild



FERRY TERMINALS, SAN FRANCISCO.

the Market-street turn-table in front of the center of the new depot; tracks coming in from the district south of Market street will be moved over where the old depot stood, considerably widening East street; and the curve at the corner of Sacramento and East street is to be removed.

## OFFICERS OF MASSACHUSETTS ASSOCIATION.

The annual meeting of the Massachusetts Street Railway Association was held in Boston on September 14, and the following officers were chosen for the ensuing year.

President, P. F. Sullivan.

First vice-president, John R. Graham.

Second vice-president, E. C. Foster.

Secretary, Charles S. Clark.

Treasurer, W. F. Pope.

Executive committee: A. A. Glasier, E. P. Shaw, William A. Bancroft, F. H. Dewey, S. M. Thomas.

Auditing committee: John N. Akarman, Robert S. Goff, P. L. Saltonstall.



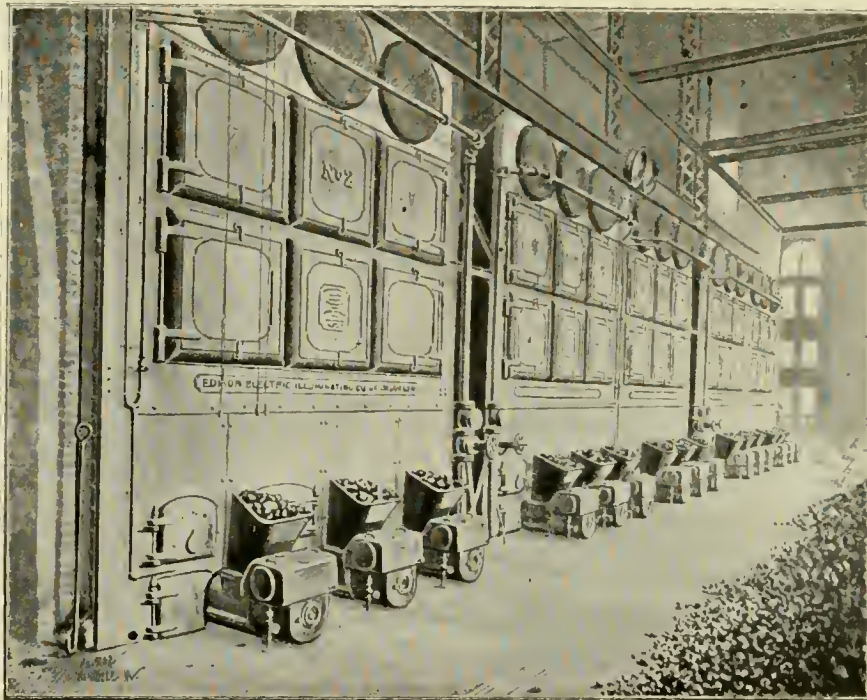
## AMERICAN STOKERS IN A BROOKLYN PLANT.

Among mechanical stokers and patent furnaces the American stoker, which has been introduced by the American Stoker Company, Washington Life building, New York, stands alone as the practical apparatus for underfeeding coal. It has been adopted in many of the most important power plants of the country, and one of the most interesting of these is that of the Edison Electric Illuminating Company, Brooklyn, N. Y., a view of the boiler room of which is shown in the accompanying illustration. This is destined to be one of the largest electrical power plants in the world as the plans contemplate an ultimate capacity of 60,000 h. p.; one-fourth of this is already installed. The boiler room is 198x46 ft.; the boilers are of the Cahall water tube type

into and up through the magazine. The stoker is entirely self-contained and complete in itself.

The rate of feeding coal is controlled by the speed of the motor, which is governed by throttling the steam in the supply pipe to the motor. The coal fed into the hopper is carried by the conveyor into the magazine which overflows on both sides and spreads it upon the sides of the grates. The coal is fed slowly and continuously, and approaching the fire in its upward course is slowly roasted and coked, the gases released from it being burned with the fresh air entering through the tuyeres. All the coal fed into the hoppers is subjected to this gas making process, and there is no loss of coal through grates as dead grates are used in the furnaces in place of open grate bars. The complete combustion produced by this method is appreciated when viewing the stack of the plant, from which there is no smoke.

This stoker is equally adapted for any size of fuel.



AMERICAN STOKERS AT UNION STATION, EDISON CO., BROOKLYN.

of 500 h. p. each. The photograph from which the engraving was made was taken before the conveying machinery was installed but it shows the American stokers already in place, three independently driven stokers to each furnace. For this plant coal (slack) is received from boats at the wharf and carried in cars to storage bins, from which it is elevated to smaller bins just above the boiler floor, and thence distributed through chutes to electrically driven conveyors which carry it to the stokers. At the ends of the chutes are automatic weighing devices which register the amount of coal passing through.

Immediately beneath the coal hopper of the stoker is a conveyor pipe which communicates with the coal magazine placed in the furnace of the boiler; a screw conveyor, or worm, in the conveyor pipe extends the entire length of this magazine. Beneath the conveyor pipe is the wind box which has an opening beneath the hopper through which the air supply for the furnace is forced. The other end of this wind box opens into the air space between the magazine and the other casing. The upper edge of the magazine is surrounded by tuyeres, or air blocks which are provided with openings for the discharge of air inwardly and outwardly. Each stoker is driven independently by a small steam motor attached to and located in front and beneath the hopper. The motor has a simple reciprocating piston so connected as to turn the conveyor shaft which forces the coal

## MOTOR CARS FOR POSTAL SERVICE IN LONDON.

We take the following from the "Mechanical World," London: "The report of the postmaster-general for the past year contains some interesting particulars concerning the experiments made with motor-cars operated by oil, steam, and electric power, for the purpose of carrying mails and parcels from the general post office to outlying districts of London. It appears generally from the trials made that the journeys were accomplished in less time than that occupied in covering the same distance by horse vans, and that the cost of the service was approximately half of that incurred with horsed mail cars. The experiments, so far as they went, showed that motor-cars are likely to prove in the near future a mode of transport for letters and parcels that will be attended with advantage both as regards speed and economy. Since then arrangements have been made for extended trials in London, on the Redhill route, in the neighborhood of Reading, and in Scotland and Ireland, and the report adds that it is confidently hoped that motor-cars may be advantageously used for permanent mail service. It is possible that the new arrangements may relate to the electric mail vans, but on this point we have no conclusive evidence at the time of writing."

## THE ELECTRIC RAILWAY AS AN AUXILIARY COAST DEFENSE.

BY W. J. CLARK.

(This paper was read before the New York Street Railway Association, but did not reach us in time for publication last month.)

The rapid history making of the past few months has caused the mention of certain problems, which a year ago would have seemed ridiculous, to be worthy now of the most serious consideration. While it is unwise to bring up for discussion here ordinary matters of state and national policy, it is conceded, I think, that no matter what differences of opinion exist among us on the question of national extension and aggrandizement, there is a unanimous feeling among all Americans that this is now a Nation begun with an exceedingly large "N," and that the true policy for its future is to strengthen it in every legitimate way, by displaying American intelligence, inventive ability and commercial shrewdness in such a manner as to make it the strongest of all earth's nations in peace, so to better preserve such relationship for all times to come.

Warlike as the title of this paper sounds, its true object is most peaceful, it being simply to advocate the adoption of a broader policy in the granting of electric railway franchises, to the end of harmonizing their construction with other electrical lines as well as with the general steam railway system of the country, all to the end of strengthening our country in peace, that she may be better prepared for war in the future, and thus avoid it.

That improved methods of transportation are equally essential to the commercial development of the country or to its defense against outside foes, if such country is well populated, is a fact which has been conceded for so long a time as modern civilization has existed. So originality cannot be claimed for the theories which are advanced herein, but the development of the electric railway and the weakness of our seacoast, in certain essentials to defense, so forcibly brought to our attention recently, makes it fitting to call attention here to the importance of the application of the theory in its broadest way to the future development of American electric railways. In this way the marvels which have been performed unconsciously in constituting an important auxiliary to our coast defenses may hereafter be made still more valuable by following some comprehensive plan dictated either by the national government or by the executive authority of the various states, working in close harmony to the attainment of a specific end, better adapted to ordinary commercial requirements than the present system of making the procurement of franchises dependent upon the whim of local township and municipalities. The latter often disregard everything outside their own immediate surroundings, and restrict railway companies from making what would be a natural form of development, which, as recited, would be of the greatest importance to the nation in guarding its coasts, should it ever be necessary to do so again.

This application of the general theory is no more original with the writer than the theory itself, for certain of the continental powers of Europe have for several years been encouraging the construction of street railways for the avowed purpose of military expediency, going so far as to grant subsidies or extraordinary concessions where the construction of the line filled in some important link in transportation facilities. The great essential insisted upon has been that, in their construction, such railways should conform in gage, special work and curvature with the general steam-railway system of the country, so that in emergencies the rolling stock of the latter could be operated over the lines of the former. This would be more especially in the case of besieged cities, to afford a means of ready transportation to all points within the line of fortifications, without breaking bulk, also to make it possible hastily to transport bodies of troops to any points within such district in the quickest possible manner.

While but little has been said concerning this policy in the public press, the work of this character which has been done about some of the European cities is astounding, and is viewed by the military authorities of such countries as being one of the

most important steps ever taken in the line of defensive military operations. This being true, it requires no argument to demonstrate that a broader application of this plan to our extended seacoast would be of far greater importance than the application of it to Europe, where good roads exist almost everywhere, for, as is well known, much of our seacoast does not enjoy the possession of good wagon roads. On the other hand, the electric lines already reach nearer to very important points along the coast than do the steam lines, while, especially along the seashore of Massachusetts, the electric lines could deliver, if necessary, many more troops in the interior within a given time at such points than would be possible for the steam railways.

All over the United States information is readily obtainable concerning the street railway systems, with their trackage, routes and rolling stock, as well as in their interconnections and the possibility of temporarily increasing the facilities of any particular road by combination with others. Such was not the condition, however, as regards electric railways when, a few months ago, we were all worrying for fear that landing parties from the then-supposed powerful Spanish navy might make it temporarily uncomfortable at certain exposed points along our Atlantic seaboard, beside destroying much valuable property. It was suggested, therefore, to the writer that he obtain maps of all the existing street railway lines along the Atlantic and Gulf coast, show their connections and intersections with the steam roads and other street railway lines, and, so far as possible, suggest how much could be done, should military necessity require it, to cause such street-railway systems to become an important auxiliary to the steam lines for rapidly moving troops and supplies to any points required along the seacoast. This work involved examination of the possibilities of making connections with the steam lines, the utilizing of such track as would be possible from its type, and the form and character of special work, so that steam rolling stock could, if necessary, be operated over the street railway lines, while the possibilities of using the current of one electric railway to help out congestion upon some other, and all such similar matters, were most carefully gone into. The work was most interesting, hurriedly though it had to be done, and, to the credit of every street railway corporation along the coast, it should be said that each and all patriotically responded to requests with the fullest information that could be desired concerning their systems, and expensive maps were furnished freely without charge. In fact, the management of certain important systems were so enthusiastic that had the War Department requested it, it is probable that many miles of new track would have been built by them without waiting to question the possibilities of its future earning power or waiting for local franchise rights. Of course, it would not be proper for the writer now to give to the world the entire results of the investigation, but to attain a most important object, and to strengthen our electric railway systems where they are weak, it should be said that stretching along the coast from Calais, Me., to Galveston, Texas, are 92 distinct street railway systems, any one of which might have been an important factor in transportation for military purposes should Spain have made a demonstration against our coast. The aggregate length of these systems is about 6,897 miles, and the capacity of some of these for handling traffic to several coast points is simply astounding, it being frequently two or three times that of the steam railways which approach the same localities.

[In a previous issue we have described the splendid work performed by the street railway in Tampa, Fla., where both men and freight were transported to the military camps; in several instances hauling siege guns, etc., where the steam locomotives in service were unable to climb the grades. Editor.]

Reports from Syracuse, N. Y., indicate that the Syracuse Rapid Transit Company will have some further trouble with its employes. The superintendent has made specific charges of "knocking down" fares against a number of the conductors, which is resented by the local union as is usually the case.



**MECHANICAL TRACTION.**

At the tenth general meeting of the Permanent International Tramway Union at Geneva, in August last, E. A. Ziffer, civil engineer and president of the council of administration of the railway company of the district of Bukovine, Vienna, made an elaborate report on the various forms of mechanical motors for tramways.

We present below an abstract of his general considerations and conclusions:

It is evident from the technical journals, the proceedings of scientific societies, and the replies made to personal inquiries, that mechanical motors for tramways have in general made progress, and that the electric motor is the principal one in Europe as well as America; in Germany in particular has the progress of electric traction been very rapid.

January 1, 1898, the electric lines in operation and under construction in Europe numbered 204, against 132 at the close of 1895. Overhead conductors are employed on 172 of these lines. Accumulators are used on 13 lines, and the mixed system on three lines. Underground conduits or third rails are employed on 16 lines.

The following figures are quoted from "La Traction Mécanique des Tramways," by M. Godfernaux:

System—	Cost in Cents per Car-Mile.		
	Operation.	Amortization.	Total.
Rowan .....	10.94	3.44	14.38
Serpellet .....	9.38	3.44	12.82
Gas Motors .....	13.44	3.44	16.88
Compressed Air .....	13.13	4.69	17.82
Accumulators .....	10.63	4.06	14.69
Trolley .....	9.69	5.31	15.00

Locomotives without fire boxes and cable traction are excluded because they are applicable to special conditions only.

Max Schiemann's resumé of comparisons of the electric lines at Budapest, Berlin, Hanover and Dresden is quoted as follows:

1. The three systems, overhead and underground lines, and accumulators are reliable.
2. Accumulators may be as economical as the overhead trolley, for cars at greater intervals than is habitual in urban service; underground conduits are not so economical as the other systems.
3. The combination between underground conduits and overhead trolley systems is always better than accumulators and trolley.

The conclusions reached by Mr. Ziffer are briefly:

Steam tramway motors have been improved and are to be recommended for branch lines and those on which the traffic is not heavy. Under this head are included what Mr. Clark of the N. Y., N. H. & H. calls "composite" cars. The Serpellet system has been improved and in France has been adopted on a large scale; there are however some objections which can scarcely be overcome, such as the escape of hot air and vapor to the annoyance of passengers.

Locomotives without fireboxes have not been further applied in practice during the last two years, though several types of motors coming under this definition are undergoing trial.

The use of compressed air for tramway traction has been but little extended.

Cable traction must not be considered as abandoned as cable plants have been recently installed in England. This mode of traction has its advantages under certain special conditions of very heavy traffic and steep grades.

Notable improvements have been made in gas motors, though there are still objectionable features. The Hoskin gasoline motor and the Daimler benzine motor are yet undergoing trial.

The accumulator system, which may be considered the ideal, is yet in process of trial in spite of divers good results obtained.

The trolley system is most widely used, is the most economical, and is to be recommended from a technical standpoint; it cannot be surpassed by accumulators. The esthetic objections to overhead lines are not urged as strongly now as a short time since.

The conduit system has made progress and gained new adherents, and its increased use may be expected, notwithstanding the high cost and the interruptions to service which have occurred in some places with its use.

The mixed system, overhead trolley and accumulators, is more practical than accumulators alone, and will probably be employed where the trolley is not authorized.

Combinations of the conduit and trolley systems have less to recommend them than the other mixed system, the inconveniences of the conduit being greater than its advantages; and it is to be remembered that there is no certainty that improvements in the art will not render the conduit obsolete in a short time. (This is not in accord with Mr. Schiemann).

The electric systems employing a closed conduit and sectioned conductors, present difficulties in protecting the conduit from moisture; efforts are still being made to improve these systems.

The third rail has proved particularly adapted for elevated and underground roads, and for surface roads having a private right of way.

But above all the overhead trolley has given the best results up to the present.

**THE SOLDIERS RETURN.**

When the 13th New York Volunteers, otherwise known as the "fighting 13th," returned from Cuba the men were ordered to different posts, some going to Fort Columbus, others to Fort Porter and others to Fort Niagara. Those sent to Fort Niagara traveled over the Lewiston & Youngstown electric line from Lewiston to Youngstown. In anticipation of their arrival the general manager, H. A. Heller, had decorated a special car most



13TH N. Y. AT LEWISTON EN ROUTE TO FT. NIAGARA.

handsomely with bunting and flags and in the run to Youngstown Mr. Heller acted as motorman. At Lewiston the school children assembled in line along the car as it left the station and waved flags and cheered the heroes, and at Youngstown there was a still more hearty reception.

When the 13th left for the front it numbered 520 men, and of these 346 answered to roll call when it returned. It started on April 19 and for nearly two months was camped in the south, leaving Tampa, Fla., on June 14 for Cuba. On June 22 it landed at Baiquiri, and July 1 led the famous charge up San Juan hill. It will be recalled that all the dispatches from the scene of battle

praised the heroism these men displayed in that notable battle. In July it was before Santiago at the siege and also when it surrendered. On August 8 the men embarked at Santiago for the United States, reaching Montauk Point, August 14, which place they left for their respective forts on September 14, arriving at Fort Niagara and Fort Porter on September 15.

The illustration shows the detachment as it left the New York Central at Lewiston, and en route for Ft. Niagara.

## LEGAL ASPECTS OF ELECTRIC TRACTION IN ENGLAND.

The "Engineering Magazine" for October, 1898, has an extremely interesting article on this subject written by E. F. Vesey Knox, M. P., which the opponents of a liberal policy towards street railways should read with profit if there really be any truth in the generally accepted theory regarding the value of experience as a school.

Mr. Knox points out that while cheap food has given England an advantage in commercial and industrial competition, the concentration and large increase of the urban population (more than doubled within a brief period) resulting therefrom have very largely increased the rental value of real estate in such cities, so that the advantage of cheap food is in a fair way to be more than offset by dear rent. Three remedies are open. The factories themselves may be scattered, by improved buildings and sanitation, more people may be cheaply and safely housed on a given area in the region of the factories, or the workers, if a system of rapid and cheap transportation is offered may live at a distance.

The author believes that the tendency of the age is toward further concentration of manufacturing plants. The results of "model dwellings" have been only to mitigate the appallingly large death rate of central London. Therefore the key to the problem is that of providing a transportation system.

The railroads can do only a part of the work. Mr. Knox says: "The statistical officer of the London county council, with every temptation to make out a case against the companies, admits that, if every company gave up all the early morning hours to a five-minute service of workmen's trains, only a very small proportion of the London workmen would be taken to their place of work, while he does not attempt to tackle the much more difficult problem of how to get them home again." Underground electric roads are so expensive that they cannot hope to give what in electric street transit would be considered cheap fares.

London which has the greatest need of surface transportation lines has 236 miles (counted as single track) of tramways within the metropolitan police district which has 6,000,000 of people. This is less than one mile for each 25,000 people. (In Chicago the proportion is 1 mile to less than 2,000 people.) Nearly one-fifth of this is single line only, creating maximum obstruction to other traffic and giving minimum of service. The average length of track owned by 13 separate undertakings in to which about one-half the total is split up is only about five miles. Except two short bits of cable road, all London cars are drawn by horses. This state of affairs is thus summed up: London has the greatest need of street railways of any city; it is the richest city; and it has the most meager system of tramways and what it has are operated by the most antiquated methods.

In England parliament will not permit municipalities to make their own bargains and at the same time will usually try to satisfy all the municipal demands. It is an offense against the crown, punishable on indictment, to break up the highway. So in England the consents of the executive, the legislature and the municipality are requisite for a traction enterprise.

In Ireland the power of parliament has been delegated to the privy council and it may authorize either urban or rural light railways, and no purchase clause need be inserted. One result is that Dublin, which has one-twentieth the population of London, has over 100 miles of tramways (measured as single track) and by the end of the year horse traction will have disappeared. Some of the lines hold in perpetuity.

In Great Britain the tramways act of 1870 has made tramway promotion very difficult. There is no power to take land for

street widening so often necessary when electric railways are to be laid. There must be both consent of the local authorities (the municipality or county council) and the road authority (the vestry). The line must be in the middle of the road. The paying question, that is paying between the rails and for 18 in. each side, by the company has given rise to constant bickering. Above all the purchase clause under which the local authority may buy the undertaking after 21 years at much less than its actual value, has prevented improvements. The cost of promotion is excessive.

Under the light railways act of 1896, the light railway commissioners have great powers. After a local inquiry they may, with the consent of the Board of Trade, authorize a local railway anywhere to be worked by any power. The commissioners have shown great hesitation in exercising their powers, and in practice seldom overrule the local authority.

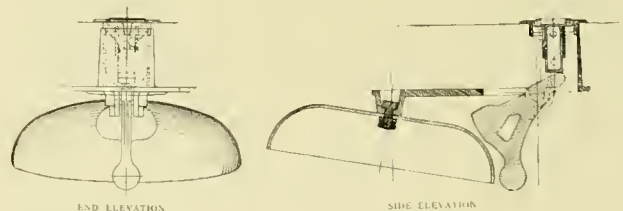
Mr. Knox concludes: "I understand that in America some learned professors have been pointing to the English examples as evidence of what benefit can be derived from the chary grant of franchises. But the municipalities which granted franchises readily had a much wider understanding of the needs of the public than the professors."

## THE DEDENDA GONG.

The accompanying illustrations are from a recent publication of the J. G. Brill Company and show a new street car gong mechanism, the "Dedenda," which has been carefully designed with a view to avoiding some objectionable features found in types now much used, one of which is the rapidity with which the treads wear or are lost or stolen.

The "Dedenda" gong mechanism consists of but four pieces, a treadle, a malleable iron guide for it which screws to the floor, a frame for holding the hammer, and the weighted hammer.

The "action" is one which produces a complete disconnection between the hammer and the treadle during the last half inch of the hammer's travel. The blow is a clear, quick one, of what may



THE DEDENDA GONG.

be called a rebounding character, and insures a clear sound.

The plunger or treadle is a hollow cylinder with a large head. When the gong is not in use a half turn of the treadle-head locks it down flush with the floor, and at the same time leaves the hammer where it cannot by any accident strike the gong. The plunger-head is recessed, so that it can be easily turned by the fingers. No cutting of the timbers or other parts of the platform is necessary; all the pieces are so shaped that they cannot be assembled except in their proper positions.

## A TRANSFER DECISION IN NEW YORK.

In a decision rendered in the municipal court, Judge Reynaud holds that the maximum fare that may be charged on the lines of the Staten Island Midland Railroad Company is 5 cents. When the motive power was changed to electricity on this road and the lines extended, the company entered into agreements with the villages and towns which the latter claim limited the fare to 5 cents and provided for free transfers. The suit decided in August last was brought by a passenger from Southfield to Prohibition Park, who was charged two fares, having to change cars to reach his destination. The court ruled that he could rely upon the contracts between the company and the towns and awarded 5 cents damages and costs. The title of the case is Cortelyou v. S. I. Midland R. R. Co.



## REMEDY FOR A DANGEROUS CROSSING.

BY F. W. BRADY, M. E.

The recent number of accidents at the railroad crossings of trolley lines has necessitated, in one case, some plan to reduce the possibility of such catastrophes. The plan, the writer proposed, was for the crossing at the point shown in Fig. 1. Formerly, the lines on each side of the tracks were owned by separate companies; one, whose track ended at the railroad tracks, and another whose line descended the hill, and, on a 90 degree curve, ran off to the right for a short distance, merely enough to clear the street and provide waiting room for the cars.

When the lines were consolidated, the first ideas of improvement included the plan of crossing the railroad, and operating through cars. Although the public was strongly in favor of the idea, a great and justifiable protest was raised against it, as



FIG. 1.

past experience with heavily loaded cars on the hill, in bad weather, had shown the usefulness of the curve at the bottom of the grade.

To meet this difficulty various plans were proposed. One desired an elevated structure built over the tracks; an impossible plan as the street is down grade for a considerable distance beyond the track; and, also, it would deprive the company of access to the depot grounds, to and from which most of the travel is carried.

Fig. 2 shows the plan to be utilized. By continuing the line past the depot, then crossing, and returning to the former line, the scheme follows the best steam road practice, of paralleling branch lines for a considerable distance before reaching the actual point of junction. It provides against runaway cars, as much, anyway, as a derailing switch could, and, additionally, the curve being of such large radius, it would be very unlikely that the car could be derailed. Then, again, it gives the cars the opportunity to run past the depot and, crossing the tracks, does it in a place where there is an unobstructed view down the line for a mile or two, and up, for fully three-quarters of a mile, when standing several feet from the rails.

Being a trolley crossing, only, the danger of obstructed view by waiting or passing wagons is prevented, although gates are to be placed at this point as an additional safeguard.

Returning along the other side of the tracks gives additional convenience to passengers alighting from trains on that side, and also augments the value of paralleling, as, from the street on the near side of the tracks, the views, both up and down, are obstructed by buildings.

At present, all of the possible precautions are taken to prevent accidents here, but they are uncertain; the signal bell often fails to operate, and when it does is often drowned by the noise of wagons on the paved street.

It is believed that the results will easily pay for the additional cost of construction, and the maintenance of the gates at the crossing. They are to be operated during the day by a paid gateman, and when he is off duty are to be left down, until the

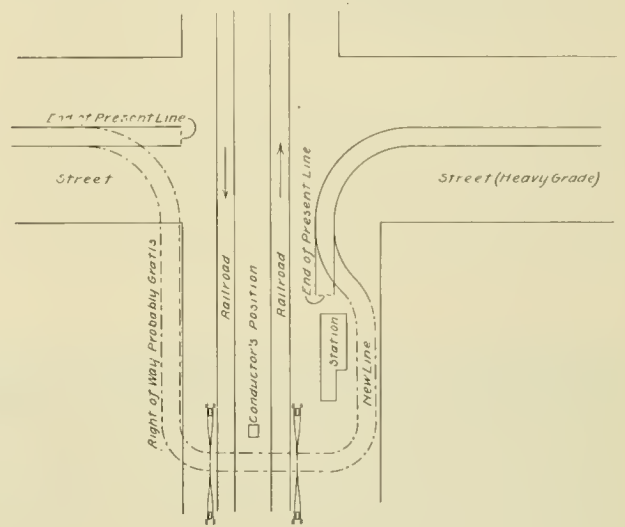


FIG. 2.

arrival of a car, whose conductor operates them from a point between the tracks, thus making sure that he gets a good view before allowing the car to proceed.

When once across, he lowers the gates by pulling one of them down, and boards his car. There is a heavy day traffic over this line, but at night it is light, the cars being run at long intervals only.

## A NEW PROCESS FOR TIES.

An architect in Munich, named Hasschmann, has brought out a new process for treating ties which is designed to produce a chemical union of the wood and the preservative; it is now under trial on the Bavarian State Railroads. The treatment consists of a double baking of the wood and treatment with sulphuric acid and sulphate of iron, and afterward in a bath of chloride of lime, to which milk of lime has been added, at a temperature of from 212° to 260° F., and at a pressure of about 40 lbs. The first baking destroys the germs of fermentation and induces the mechanical union of the preservatives with the wood fibers, and the second hardens the wood and is said to so change its character that it remains dry even when laid in damp places. The whole process takes about six hours and the cost two cents each for ordinary ties. The hardening of the wood is quite remarkable and the durability considerably increased.

## CHICAGO ROADS AND THE PEACE JUBILEE.

It is announced that all the electric cars which serve the downtown district of Chicago are to be brilliantly illuminated and elaborately decorated with bunting during the coming peace jubilee. This plan includes the elevated lines, and an endeavor will be made to have the three elevated roads adopt uniform schemes of decorations. The elevated structure itself will be trimmed with bunting and electric lights at those points where it is in view from the line of march.

It is stated that a company has been organized at Kalama-zoo, Mich., to make trolley wheels under a new patent.

# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

The North Chicago Street Railroad Company, which has heretofore driven the dynamos required for lighting the La Salle street tunnel and the La Salle avenue cable power station, one incandescent and two arc machines, by two steam engines, has recently substituted a 65-h. p., 500-volt motor for the engines. Current for the motor is brought from the Hawthorne avenue station. By this arrangement the cost of the lights is reduced and an all night service furnished. The cable station is closed down at about 1 a. m.

\* \* \*

H. Couriot, in a communication to the Paris Academy of Sciences, suggests that X-rays may prove efficient in determining the value of fuels. Carbon, in all its forms, is exceedingly transparent to the rays, while silica and silicates are opaque; and, on placing a lump of coal between the tube and the screen, all the intimate details of the slag and clinker forming portions of the fuel at once appear. Mr. Couriot has tested in this way anthracite coal, lignite, peat, coke and block fuel. The finest particles of silicate, though quite invisible to the eye, show up at once on the screen as dark spots or bands upon a white ground. The differences in the quality of a series of coals can be traced step by step, showing at once the variations in the purity of the fuel. The conglomerate structure of block fuel is clearly exhibited, while with coke the particles of iron sulphide are indicated by black spots on the fluorescent image. Carbon is so transparent, it is unnecessary that the samples should be regular blocks, as rough blocks, the sides of which usually follow the natural planes of cleavage of the coal, serve perfectly well.

\* \* \*

W. P. Hardesty, C. E., in a recent number of "Engineering News" describes what is the highest chimney in America and the fifth highest in the world. It is the stack of the Omaha & Grant Smelter, at Denver, Col., built in 1892 at a cost of \$53,000, and is the outlet for all the smoke and gases from these works, which cover some 50 acres of ground; the underground passages leading to the chimney aggregate nearly two miles in length. The outside of the chimney is square for the first 25 ft. and then the corners are battered off and the section becomes octagonal at a height of 64 ft. In the exterior lines there is a slight swelling, or entasis, as it is technically called.

The main dimensions are: Height above the stone table at ground, 352 ft. 7 in.; size at base, 33 ft. square; size at throat, 20 ft. in diameter; thickness of outer shell at base, 48½ in.; at top, 13 in.; thickness of core at base, 26 in.; at top, 9 in.; diameter flue, 16 ft.; foundation, 56 ft. square by 16 ft. deep.

For the first 8 ft. the foundation consists of cement concrete, with a grillage of steel rails laid nearly together, and crossing at right angles. Two heavy systems of tie rods runs through the chimney near its base in each direction. Where the main flue conveying the gases enters the chimney, an arch is sprung over the opening. The clearance between the flat sides of the shell and the outside of the core varies from over 2 ft. at the bottom to only 3 or 4 in. at the top. At intervals along the sides are placed rollers to brace the core against the shell and to allow of the movement of the former in expansion. The expansion of the core when heated was estimated at about 4 ins. The draft to be expected under probable conditions as to temperature was taken to be equivalent to that caused by a pressure of 1-10 lb. per sq. ft.

The bricks were hard pressed, from Golden, Col., and above the foundation were laid in mortar, the larger part of which was lime; the average mixture consisted of a soft paste, made of neat cement added to six times its volume of lime mortar; nearer the top the proportion of lime was increased. At intervals of 20 ft. vertically wrought iron bands 4 in. by ½ in. are built in 4 in. from the outer face. The top is reached by a ladder between the outer shell and the core.

The material used comprised:

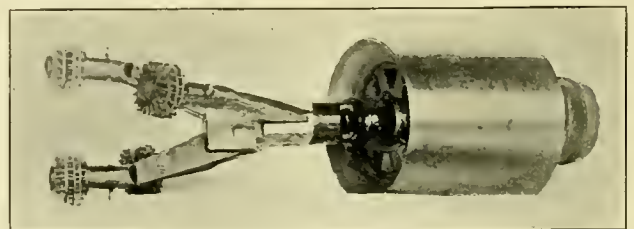
Brick .....	1,943,000
Lime, bushels .....	8,480
Portland cement, .....	Bbls.
1. In concrete .....	775
2. In stone work.....	26
3. In brick work.....	707
Total .....	1,508
Sand .....	2,331 cu. yds.
Railroad iron in concrete.....	48,960 lbs.
Beams under openings .....	2,574 "
Wrought-iron bands and rolls.....	23,180 "
C. I. plates and cap.....	56,474 "
Total .....	131,188 "

\* \* \*

## Cleaning Water Tube Boilers.

The admitted advantages of water tube boilers in efficiency and safety have led to their almost universal adoption in large plants and the proportion of water-tube boilers to the total installed in small plants has greatly increased within the last six years.

One of the most difficult problems, perhaps it is not putting it too strong to say the most difficult problem, confronting the users of water tube boilers has been that of cleaning the interior of the tubes. It is a quite simple matter to keep the fire surfaces of such boilers free from soot; the tubes need only to have a jet of steam turned on them occasionally. But freeing the interior of



THE TURBINE BOILER CLEANER.

the tubes from scale was a different problem, the operation was long, tedious and expensive, and where the water used was particularly bad, and much scale was formed in the boilers, many of the water tube types were out of the question.

In those types which had perfectly straight tubes, with free access to each, they could be cleaned by means of a cutting tool or scraper on a bar which was thrust through from end to end. Where the tubes were connected to drums or headers at each end of sufficient size to permit a man to enter and work, chains with

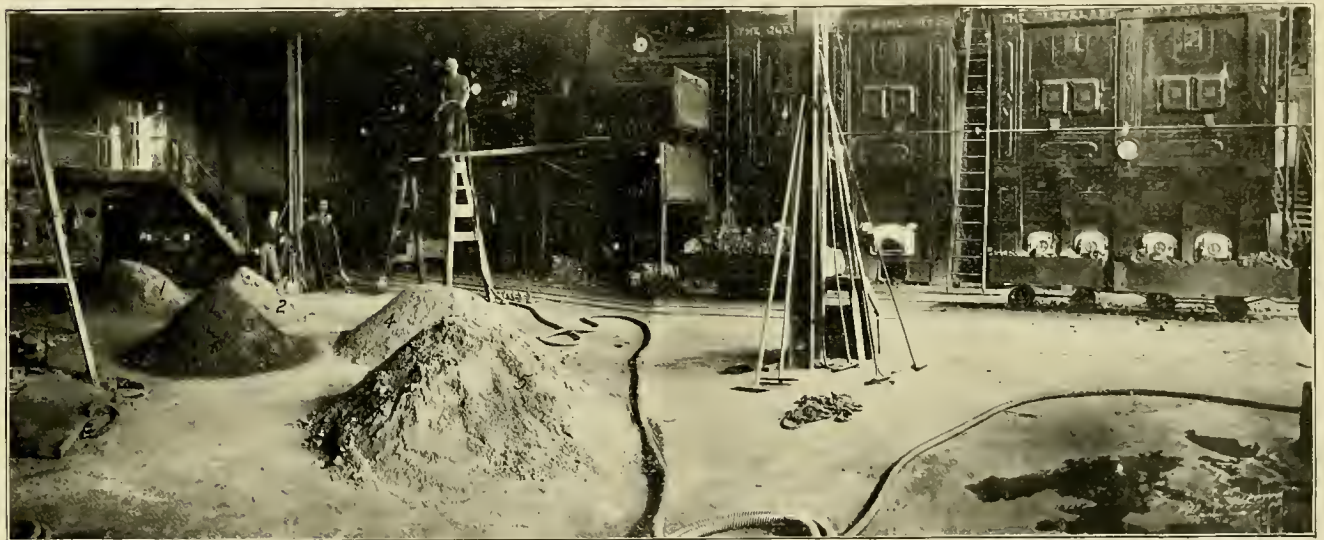


scraping or cutting tools on them, could be drawn back and forth and the scale thus loosened, but at a high cost for labor.

There was never a boiler designed in which scale will not deposit if the water used in it contains the necessary ingredients, and when scale does form it means a decrease in the efficiency of the heating surface, and if at all thick will soon result in overheating the tube where exposed to the fire.

The accompanying illustration shows how bad the state of affairs may be, even when the boilers receive what is considered good care. It is a view of the boiler room of the power house of the Cleveland City Railway Company, and in the foreground are five heaps of scale removed from the five boilers. The weights are something astounding, being as follows:

No. 1.....	3,160 lbs.
No. 2.....	3,120 lbs.
No. 3.....	3,340 lbs.
No. 4.....	3,512 lbs.
No. 5.....	3,524 lbs.
Total .....	16,656 lbs.



OVER 8 TONS OF SCALE FROM FIVE BOILERS.

These boilers are of two well-known makes, three of one kind rated at 360 h. p. each and two of another rated at 375 h. p. each.

The scale was removed by the Chicago turbine cleaner which is shown in the smaller engravings; the tool comprises a water turbine enclosed in a case about 2½ in. in diameter and 3 in. long; to the turbine shaft is connected the cleaner proper by means of a universal joint so that the tool may be passed through curved tubes equally as well as through straight ones. The cutting tools are toothed wheels such as are used for dressing emery wheels, and are mounted on four arms about 5 in. in length, hinged to a central shaft. Water is supplied through a wire-wrapped hose at a pressure as near 100 lbs. per sq. in. as the source of supply permits. The principle is easily understood; the turbine revolves at a speed of from 1,500 to 2,500 r. p. m., according to the pressure; and the arms are thrown out by centrifugal force; the scale when cut away is washed out by the stream of water from the turbine.

These tools are made by the Chicago Boiler Cleaner Company, of 828 Monadnock building, Chicago, which also makes all lines of boiler cleaning devices.

\* \* \*

### Economy in the Boiler Room.

From a paper read before the Canadian Association of Stationary Engineers, by Charles Moseley, Chief Engineer of the Toronto Incandescent Light Company.

The fuel expense is one of the largest in the operation of the majority of plants, and any reduction which can be made in the amount of fuel used, while maintaining the same amount of

power, is considered a direct gain. The evaporation of more than 9 lbs. of water per lb. of coal is looked upon with suspicion by many, as it is thought impossible to obtain more than this amount in even the best designed and well regulated furnaces and boilers, especially when the firing is done by hand. Mechanically fed boiler furnaces usually give the most economical results. The actual value of the fuel depends upon the way in which it is used fully as much as on any other factor. The heat unit in the coal should be as much as possible utilized. In one pound of good steam coal there are about 14,000 B. T. U., and about 10,000 of this amount can be utilized, so that 4,000 heat units are lost.

The mixture of gases in a furnace depends on the amount of air used. One pound of coal requires, theoretically, about 12 lbs. of air to burn completely, but in practice about twice this amount is required in the boiler furnace. To cause good combustion, coal requires a good draft; the gases are consumed near the fire and the waste gases carry the heat to the boiler on their way to the stack. The boiler ought to have sufficient heating surface, or the hot wasted gases ought to travel a sufficient dis-

tance to be cooled down to about 350 degrees F., which temperature is found high enough to produce a good draft in a stack at least 100 ft. high. It is not necessary for me to state the need of keeping the combustion chambers free from the ash that is carried over with the gases to the chambers.

In "Smokeless Heat," published by the General Engineering Company, there is a paragraph entitled, "Competitive vs. Ordinary Test," which is well worth consideration, and I think we might study it with profit. In nearly all plants where a large quantity of coal is burned per day, it is a general rule to employ the least possible number of firemen, and it keeps them very busy going from one boiler to another shoveling coal in the whole time. It becomes more of the nature of slavery than anything else. Is there economy in this way of working? Let us see.

In making evaporation tests my experience has been that there is a large difference between ordinary working and working for short spells, as in making competitive tests. When we were making tests in our plant while experimenting with shaking grates, we did so in many different ways. In one particular case we fired the boiler as we would in ordinary practice, and the result was certainly a far different one from that obtained when the man stood by the furnace and attended to it alone. If we treat the firemen as being naturally lazy, I think we will be on the safe side, and you can rest assured that if he has one boiler that will do the same work as another with half the labor even though the other takes less coal, this boiler will get the most work, and the boiler that should receive constant at-

tion will get very little consideration from him. Between competitive and ordinary working on a hand fired boiler there is actually a difference of 10 per cent. This I have proved repeatedly, and in many cases it has run up as high as 12 per cent. What does this mean? Does it mean that it would pay to have a man at each boiler and simply attend to it alone? No, it does not, for the simple reason that the less a man has to do the less he is inclined to do, and this applies more to firemen than to anyone else.

I might state that when we were testing mechanical stokers we had long periods when we had competitive tests, and others again when we ran as in ordinary practice, that is to say, the fireman doing just precisely as he would do if no test was being made. The coal and water, however, were measured in each case. The results were simply astonishing. In the ordinary running test the stoker would do about 50 per cent more work and nearly 25 per cent better economy, whereas in the competitive test the work done on the stoker was about 25 per cent more and 15 per cent increased economy, which bears out the statement that between competitive and ordinary running we have a difference of 10 per cent. Now, which is the correct way to look at this matter? Can we obtain results right along with hand firing equivalent to those obtained during a competitive test? I do not think so, because firemen as a rule do not like to be beaten, and will do their very best during a competitive test to do up the other fellow, but at the same time he is wishing inwardly that the test was over, so as to get back to the old style again.

There are many plants in Canada where very good results are obtained, if we take the results as shown by engineers into consideration, several of them showing a usual 14 lbs. evaporation per pound of coal. This, you will readily understand, is out of the question. There are also a large number where very poor results are obtained, and these poor results are due to several causes, namely: Boilers in very bad order, dirty tubes, poor setting, poor boilers, poor firemen, etc. The men who sell boiler compounds will, in all probability say that you do not use enough of their compounds. Your answer to that is, of course, that there are compounds on the market that are absolutely of no use whatever, and it is simply throwing money away to buy it. I myself believe in a good compound, but will admit that it is difficult to get it. You may get one barrel (the first from a new maker) fairly good, the second of no use whatever, and so it goes. A good compound is required and to my mind today we have not such a thing. All compound makers ask you in their advertisements to send on a sample of your water and they will give you the very compound you require after analysis. You, of course, know what this means—that if one brand does not work they will send another brand, of practically the same material, with another name, and you try it.

Poor boilers and poor setting: This is attributed to trying to keep down the first cost. Pay a good figure for a good boiler, and have it set by competent men.

Poor firemen: This, in my humble judgment, is the most important item, and one that should receive much consideration. The fireman may not be poor, but the work he has to attend to—namely, firing too many boilers—makes him feel that he is nothing more or less than a laborer, and as long as he keeps the steam pressure up, no matter how much coal he burns or how he does it, there appears to be little or no attention paid to him. There are many places where the fireman is never thought of except when the steam pressure goes down, and when such is the case the usual deputation calls upon him to ascertain if he is asleep or not. A good fireman is really a skilled workman, and should be treated as such. He should receive a fair salary, and his employer should bear in mind that any reduction in his pay is far from being a saving. If he cuts down \$2 per week, you will in all probability find your coal bill increased about \$8, and there is not much economy there.

How are we to obtain better results in our boiler rooms? I think by putting in machines to do the work, and having men simply to look after them.

## Some Elementary Mechanical Formulas.

J. H. MONTAGUE.

One of the important calculations is that to determine the power of an engine, which is expressed in horse-power or h. p. This is either the indicated horse-power, abbreviated i. h. p., or the brake horse-power, usually abbreviated b. h. p. To understand these terms and how they are obtained, one must have a clear idea of the meaning of "work" and "power." Work is overcoming resistance through space, or is the result of a force acting through space, and is measured by multiplying the force by the distance through which it acts, or by multiplying the resistance by the distance or space through which it is overcome. The English unit of work usually employed is the foot-pound or ft. lb., which means the work done in lifting 1 lb. 1 ft. high against the force of gravity, or the work done in pushing or pulling against a force of 1 lb. for a distance of 1 ft. That is, force or resistance, in pounds  $\times$  distance or space, in feet = work, in foot-pounds. There are other units of work such as foot-tons, inch-pounds, inch-tons, etc., meaning in each case the work done in moving the distance named against the force named.

Power is the rate of doing work, and the unit of power is the horse-power, which is 33,000 ft. lbs. of work per minute. That is an engine of 1 b. h. p. can lift 33,000 lbs. 1 ft. in 1 minute. We owe this term to James Watt, who found that a strong horse could do 22,000 ft. lbs. per minute for several hours per day, and in order that those who supplanted horses by steam engines should have good measure he called 33,000 ft. lbs. per minute (or just 50 per cent more than a horse could do) a horse-power when he wished to rate his engines. The work done in lifting a given weight a given distance is the same no matter what the time in which it is done, but the power required to lift it is very different; a 1-h. p. engine would require 10 times as long to do the same work as a 10-h. p. engine.

Engines are usually rated according to the indicated horse-power or the power that is developed in the cylinder when running at a given speed and at a given cut-off. The indicated horse-power is so-called because it is determined by means of an "indicator," which is a mechanism for finding the pressure in the engine piston at each point of the stroke. The steam engine indicator is attached to the engine cylinder and has a small cylinder with a piston in it which works against a spring. Connected to the rod of this piston are some levers with a pencil at the end of one of them, and the levers are arranged to work in guides, so that the pencil moves up and down in what is very nearly a straight line. The springs used in the indicator cylinder are carefully made so that the pencil moves up equal distances for equal increases in pressures on the indicator piston. Each spring has a number stamped on it showing the number of pounds pressure per square inch on the piston that will move the pencil point of the indicator 1 in.

The pencil traces a line on a piece of paper that is wrapped around the drum of the indicator. The drum is moved by a piece of string or wire wrapped around it and connected to the cross-head of the engine. As the motion of the indicator drum is usually only about 4 in. and the engine stroke much longer, a reducing motion of some kind is used; these are of many different styles but the object is always the same, to have the indicator drum move the same proportion of its total motion that the piston of the engine has moved of its total motion.

As the pencil of the indicator moves up and down and the drum moves back and forth at the same time, both return to the starting point, the pencil traces a closed curve on the paper, and this curve is called an indicator diagram.

Of course to find the total power of the engine we must have diagrams from both the head and crank ends of the cylinder, such for instance as are shown in Figs. 1 and 2.

In these figures the lines MN and PQ are traced by the pencil before steam is admitted to the indicator and are called the atmospheric lines, because only the pressure of the air is on the indicator piston and as the same pressure is on both sides the spring is not compressed. Now in the figure the length of the diagram is a proportional part of the length of the stroke of the



engine, and also the distance of any point on the closed curve above the atmospheric line is proportional to the steam pressure (above the atmosphere) in the steam cylinder at that point of the stroke. To find what this pressure is in lbs. per sq. in. at X for instance, measure O X and multiply it by the scale marked on the indicator spring; if O X measures  $1\frac{1}{4}$  in. and the scale of the spring is 40 lbs. to the inch, then the pressure in the cylinder when the piston has advanced from M to O is  $1\frac{1}{4} \times 40 = 50$  lbs. per

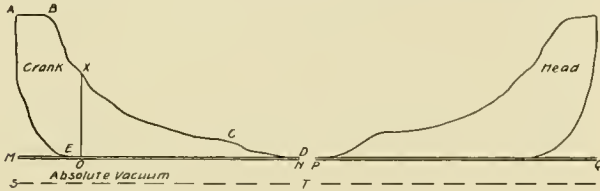


FIG. 1.

FIG. 2.

sq. in. The average height of the line A B C D above the line MN, multiplied by the scale of the spring is the mean pressure per square inch during the forward stroke when the steam is doing work on the piston; the average height of the back pressure line DEA above M N multiplied by the scale of the spring is the mean pressure on piston during the return stroke when the piston is doing work in the steam forcing it out of the cylinder. The difference between these two mean pressures is the mean effective pressure, that is the average net pressure effective for doing work. The mean effective pressure is usually called P in the formula for horse-power.

If the engine is a condensing one, so that the back pressure in the cylinder is less than the atmospheric pressure, it is customary to draw a line ST parallel to MN and at a distance below it corresponding to the atmospheric pressure at the time the diagram was taken; this is in most cases not far from 14.7 lbs. per sq. in. The forward and back pressures are then measured above this "absolute vacuum" line.

To find the mean effective pressure it is not necessary to find the mean forward pressure and then the mean back pressure and subtract them, but we may find the average height of the diagram, that is the average distance between A B C D and A E D, and multiply it by the scale of the indicator spring. This may be done by finding the area of the diagram with a planimeter and dividing by the length, or it may be found by measuring the heights at a number of points and averaging them. A simple way of doing this is to proceed as follows. Take the diagram and draw lines through A and D at right angles to MN (see Fig. 3.) Then on a piece of paper or ruler somewhat longer than MN, lay off 12 points, so as to make nine spaces of one length and two spaces (one at each end) of half length. Lay this down on the diagram with the end points on the lines through the ends of the diagram and prick off the ten intermediate points on the card. When lines are drawn through these points as shown in Fig. 3, the length of the portion shown solid represents approximately the average height of one of the portions of the diagram. When the 10 lines are added together and divided by 10 we have the mean height of the diagram. In adding the lengths of these lines the most convenient method is to place a strip of paper along line 1, and lay off the length on it, then slip the paper up and place it beside line 2, so that the bottom mark comes at the top of line 2, and lay off the length of line 2. By proceeding in this way there is only one distance to measure instead of 10, and the addition of the many fractions that would occur in the dimensions of 10 shorter lines is avoided. This method of finding the mean height of an indicator diagram was much used before planimeters became so common as they are today, and it is a fairly accurate one.

Having thus found from the indicator diagram the mean effective pressure per sq. in. for both the head end and the crank, which may be called P' and P'', respectively, it is only necessary to know the areas of the piston on which they act to find the total pressure or force which is one factor in computing the work done.

The area of the piston in square inches is the square of the

radius, in inches, multiplied by 3.1416; it is perhaps more often put as .7854 times the square of the diameter. A convenient way of computing the area of a circle is to multiply the square of the radius by 355 and divide by 113. The effective area of the crank side of the piston will be less than that of the head side because the area of the cross section of the piston rod must be subtracted. The area of the piston is called A in the formula for horse power; we may call it A' for the head end, and A'' for the crank end.

Now multiplying by the mean effective pressure for each end we have P'xA' as the total average effective pressure on the head end, and P''xA'' on the crank end. These are in pounds since P' is measured in lbs. per sq. in. and A is the number of square inches, on which the pressure acts. The average pressure acts throughout the stroke of the piston, so that when P'xA' is multiplied by the length of the stroke in feet, the result is the work in foot-pounds, done in that end of the cylinder in one revolution of the engine. The stroke in feet is usually called L. Hence P'xA'L=work done in head end in one revolution; P''xA''L=work done in crank end in one revolution.

Usually A'' is not much different from A', and the error will be small if we take half their sum and call it A. Then if we put P as the sum of P' and P'', the work done in both ends of the cylinder in one revolution is PxA'L.

To find the horse-power we must know the work done *per minute*. If the number of revolutions of the engine be counted, and called N, we then have PxA'LxN=work done per minute. This is easier to remember if we write it PLAN=work. But, as we saw, a horse-power is 33,000 ft. lb. of work per minute. Hence the horse-power, h. p.=PLAN÷33,000.

To work out an example. Suppose the cylinder to be 10 in. in diameter and 15 in. stroke, the speed of the engine 130 r. p. m., and the mean effective pressure 36 lbs. per sq. in. in the head end and 37 lbs. per sq. in. in the crank end of the cylinder. Here P'=36; P''=37; and hence P=73; N=130; L=15÷12=1.25; A'=10×10×.7854=78.54; A''=78.54-(2×2×.7854)=75.40; A=½(78.54+75.40)=76.97. Hence horse-power=(73×1.25×76.97×130)÷33,000=27.7.

When an engine is designed, the power which it will develop is computed by drawing an indicator diagram such as the engine will probably make and finding the horse power in the same way as that already described. To draw such a diagram we start with the initial pressure, the point of cut-off or valve closure, the back pressure, and the point where compression begins.

Suppose the steam pressure is to be 100 lbs. in the steam chest as measured by a steam gage, and the back pressure 1 lb. above the atmosphere. The pressure above an absolute vacuum is greater by about 14.7 lbs. per sq. in. than the gage pressure, because the ordinary steam gage operates by the expansion of a tube inside of which is the steam pressure and outside the atmospheric pressure, and the zero point is taken when there is atmospheric pressure both inside and outside the tube. For the example given it will be sufficiently accurate to call the pressure of the air 15 lbs. per sq. in. The absolute pressure at admission in our engine will be, therefore, 100+15=115 lbs., and the back pressure 1+15=16 lbs.

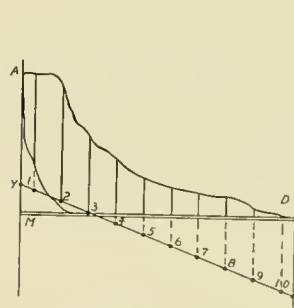


FIG. 3.

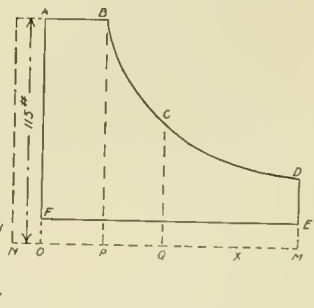


FIG. 4.

It has been found by experiment that in a steam engine after cut-off the product of the absolute pressure by the volume is very nearly constant and we can thus find the indicator diagram that our engine will make.

Suppose it is to cut off steam at one-quarter stroke, and that the clearance space (that is, the space between the cylinder head and piston at the end of the stroke, added to the steam passages), is 10 per cent of the volume swept through by the piston. That is to say if the stroke is 20 in. the clearance would be equal to a cylinder of the same diameter and 2 in. long.

Now draw OM in Fig. 4 for an absolute vacuum line and make its length proportional to the stroke, and OA to denote the pressure per sq. in. on the piston at the beginning of the stroke. Make ON=1/10 of OM so that if OX equals the volume of the cylinder behind the piston at any time, the volume including the clearance will be NX. Since cut-off is to be at one-fourth stroke draw AB equal to 1/4 OM. At the end of the stroke the absolute pressure will be  $115 \text{ lbs.} \times N \div NM = 115 \times (.10 + .25) \div (.10 + 1.00) = 36.6 \text{ lbs.}$  Therefore lay off MD=36.6 lbs. At half stroke the pressure will be  $115 \times (.10 + .25) \div (.10 + .50) = 67 \text{ lbs.}$  Therefore lay off QC=67 lbs. So if we wish every point in the line BCD could be found. When the exhaust opens at D the pressure drops to 16 lbs. absolute and we draw the back pressure line EF so that ME=16 lbs. If there is no compression the back pressure line will run back and cut OA at F, and the diagram is complete. Of course, in an actual engine the corners at BDE and F would be rounded off and the area slightly reduced, but this may be neglected here.

Having now drawn the diagram the mean effective pressure may be found in the manner before described but it is more readily found by a formula.

$P = [p(1 + \text{hyp. log } r) \div r] - b$ , in which P is the mean effective pressure, p the absolute initial pressure, b the absolute back pressure, and r the ratio of expansion and hyp. log r the hyperbolic logarithm of r. The ratio of expansion of any engine is the volume of the cylinder at the end of the stroke including the clearance, divided by the volume of the cylinder at cut-off, including the clearance.

This formula may be used to get the horse-power, approximately, if the point of cut-off, the initial pressure and the volume of the clearance space are known. Thus suppose we have an engine of 30 in. stroke cutting off at one-fourth; the clearance equal to 10 per cent of the volume swept through by the piston, that is, equivalent to the volume the piston sweeps when it moves 3 in.; the initial pressure, 150 lbs. absolute; the back pressure, 16 lbs. absolute.

Here the ratio of expansion is  $(30+3) \div (7\frac{1}{2}+3) = 33 \div 10.5 = 3.14$ . Looking in a table of hyperbolic logarithms (found in any engineers' handbook) we find hyp. log 3.14=1.1442, hence

$$P = [150(1 + 1.1442) \div 3.14] - 16 = 102.4 - 16 = 86.4.$$

When twice this is substituted in  $PLAN \div 33,000$  we get the horse-power.

For engines of small power a very simple brake is made by wrapping a rope about the fly-wheel and attaching a weight to one end and a spring balance to the other, as shown in Fig. 5.

The weight W rests on scales, and the spring balance is fastened to the floor. The rope is prevented from slipping sidewise by wooden blocks which project over the rim. The pull down at A in Fig. 5 is the difference between the scale reading when the fly-wheel is at rest and the scale reading when it is in motion, and the pull down at B is the reading of the spring balance.

There must be some way of getting rid of the heat due to the friction between the wheel and rope. If the wheel has inside flanges water may be poured on the inside; if not, water steadily poured on the outside in not too great quantity will serve the purpose very well.

The brake horse-power is the power of the engine to do useful work and is less than the indicated horse-power by the power

required to overcome the friction of the engine. The brake horse-power is so-called because the power available for useful work is generally found by putting a brake on the fly-wheel. The work done in a given time is found by multiplying the distance a point on the outside of the wheel moves by the resistance that it moves against.

When the wheel is revolving in the direction of the arrow the friction between the rope and the wheel tends to raise the weight and lift the load from the scale to the rope.

The resistance against which the wheel turns is the difference between the pull at A and the pull at B, multiplied by the distance from the center of the shaft to the center of the rope and divided by the radius of the wheel.

The pulls at A and B are at a distance m from the center of the shaft, and the rubbing surface of the wheel is at the distance R which is nearer the center (that is nearer the fulcrum of the lever) and the pull at the wheel surface is greater than A or B in the ratio of m to R. This makes the force or resistance  $(A-B) \frac{m}{R}$ .

The distance through which the force is exerted is the distance a point on the outside of the wheel moves. This is  $2R \times 3.1416 \times N$ , where N is the number of revolutions per minute. Since the expression for force has R for a divisor and that for distance has R as a multiplier they will cancel out when multiplied together and the work per minute is  $(A-B) \times 2m \times 3.1416 \times N$ . That is, take the force A-B, and the distance as that which a point on the circumference of a wheel 2m in diameter would move.

If the wheel is 4 ft. in diameter and the rope 3/4 in. in diameter,  $2m = 4.0625 \text{ ft.}$  If the weight W is 50 lbs., the scales reading 30 lbs., the spring balance reading 1 1/4 lbs., and the revolutions 150, we have for the work done per minute,

$$(50 - 30 - 1\frac{1}{4}) \times 4.0625 \times 3.1416 \times 150 = 35,894 \text{ ft. lbs., and the power is } 35,894 \div 33,000 = 1.09 \text{ h. p.}$$

This form of brake is very convenient because it is self-regulating; if for some reason the rope takes too strong a grip on the wheel so that the pull at A is greater than the average, the weight W is raised slightly, the rope carried over the wheel and the pull on the spring balance at B is reduced; when the pull at B is reduced the rope is not pulled against the wheel so hard, the friction is less and the pull at A is reduced and that at B increased. This see-saw of the rope is slight and the spring balance and scale readings are nearly constant.

There are many forms of brakes but the principle of all is the same; the force at the end of a lever is multiplied by the distance that the point of application would travel, were it to revolve with the wheel, and the result reduced to h. p.

The Buffalo, North Main Street & Tonawanda Electric Railway Company has been enjoined from tearing down its power house at Tonawanda and removing the machinery, by J. M. Clapp, who has a mortgage of \$4,800 on the property.

In the new testing laboratory of Purdue University, which was built and equipped this summer, there is an exhibit of street railway trucks. There are three Brill trucks, a maximum traction, a double "Perfect" and the 21-E truck for four wheel cars. The "Lord Baltimore" truck, made by the Baltimore Car Wheel Company, is also exhibited.

In the United States consular reports from British Columbia it is announced that the work on the power plant and transmission line from Sooke Mountains to Victoria has been completed. The current is used for lighting and street railway purposes. The water from the mountains starts 2,300 ft. above the level of the sea, and is the highest fall in Canada. About 700 ft. above sea level and 16 miles from Victoria, these waters form a lake covering 150 acres; into which empties Goldstream river, which is tapped three miles from its source by an artificial lake or reservoir covering 7 1/2 acres, 1,122 ft. above sea level. From this reservoir the water passes through a steel pipe 33 in. in diameter, 6,700 ft. to the power house of the electric company, which is 460 ft. above sea level, thus giving a fall of 1,000 ft. from the main lake, developing 1,500 h. p.

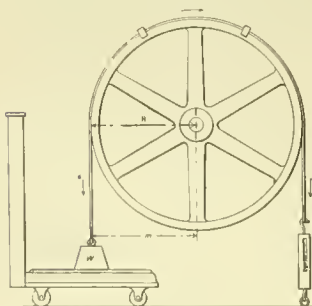


FIG. 5.



## LUBRICATION AND THE TESTING OF OILS.

BY G. W. BISSELL, M. E., IOWA STATE COLLEGE, AMES, IOWA.

### PART I.

It has long been known that the friction which exists between two bodies which rub on each other may be greatly reduced by the insertion between the rubbing surfaces of a third body or substance, between which and each of the others a lower friction exists than between the two original bodies. This third substance is called an unguent, or more commonly a lubricant, and usually is a liquid. In general any liquid will answer the purpose, provided it can be kept between the surfaces, but in most cases some kind of oil is employed because oils have the property of adherence to the surfaces of metals which constitute most rubbing surfaces with which the engineer is familiar. This property of adherence, together with capillarity and body, gives to all oils in some degree the ability to stay as a film between rubbing surfaces even under severe pressure.

The friction which exists between two solids rubbing directly upon each other is called "solid" friction. The friction which exists between two bodies separated by a film of lubricant is called "mediate" friction. If there be complete adherence of the lubricant to the bearing surfaces and complete separation of them by the film, the friction which is manifested is due entirely to the sliding of the particles of the lubricant on each other. This is called "fluid" friction. This fluid friction is very small in amount and the consequent friction losses in machinery which is well lubricated ought, therefore, to be small. But in practice it is found impossible to make bearing surfaces so true that the separation by the film of lubricant is complete. The result is that the metals come into contact with each other and we have the conditions of solid friction.

Mediate friction is, then, in fact, made up of two components, one, fluid friction, the other, solid friction. By care in construction and by the judicious selection of a lubricant, the solid friction component may be made very small and the total friction loss be kept way below what would exist if the bearing surfaces rubbed on each other directly. As an example, the various useful metals have, roughly, coefficients of friction upon each other of about 25 per cent. By lubrication this may be reduced to 5 per cent or less for a single bearing which is carefully fitted, and for so complicated a machine as the steam engine, the friction loss may be reduced by care in design and in lubrication to 10 per cent of the indicated horse power at full load.

It is seen then that the successful and economical utilization of the power applied to a machine depends upon two things:

1. The design and construction of the journals. This involves the strength and stiffness of the parts of the machine.
2. The judicious selection and application of the lubricant.

The first topic is not within the province of this paper.

The selection and application of the lubricant to the best advantage demands a knowledge of the working conditions, viz: pressure, relative velocity and temperature of the bearing surfaces and a knowledge of the properties of lubricants.

**Pressure on the Bearing Surface.** (1) If in the middle of a small surface plate, say 1 in. square, there be placed a drop of oil and a similar surface plate be placed face down on the first and a small pressure be exerted to bring the plates together, it will be noticed that some time elapses before the oil appears at the edges of the plates. (2) If the experiment be repeated with a greater applied pressure the oil will reach the edges sooner than in the first case. Again, (3) if a drop of thicker oil be used than in cases (1) and (2), a longer time will be required to cause the oil to appear at the edges with the same applied forces as before, or (4) greater applied forces will be necessary to squeeze out the oil in the same time. Again, (5) if the applied pressures be rapidly intermittent the oil may not appear at the edges at all.

**Relative Velocity of the Bearing Surfaces.** (6) If the two surface plates be turned on each other with the drop of oil between, the latter will appear more quickly than in cases (1) to (5), other conditions being the same, and this will be more noticeable the more rapid the motion, but (7) if the turning of the plates be

reciprocating the oil will be squeezed out more slowly than in case (6), but more quickly than in case (5).

**Temperature of the Bearing Surfaces.** (8) If the surface plates be warmed a few degrees and the above experiments repeated, the oil will appear more quickly than in the original experiments. (9) The temperature may be high enough to decompose the oil.

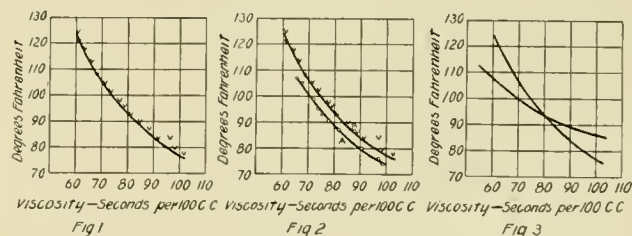
Most of these facts are very well illustrated in the principal bearings of the steam engine. The main bearing has dimensions such that the pressure per square inch of projected area shall not exceed say 250 lbs. The conditions are rubbing surfaces moving always in the same direction and comparatively steady application of pressure; analogous to cases (1) and (6) above. The crank pin for the same engine will probably be allowed a pressure per square inch of projected area of 400 lbs. The conditions are rubbing surfaces moving always in the same direction and intermittent pressure; analogous to cases (5) and (6) above. The cross-head pin for the same engine will probably carry a pressure of 700 lbs. per square inch of projected area. The conditions are intermittent pressure and reversal of direction of relative rubbing; analogous to cases (5) and (7) above.

#### PROPERTIES OF LUBRICANTS.

The principal properties of lubricants are viscosity, specific gravity, burning, flashing and freezing points and coefficient of friction. No one of these properties can be the criterion of the usefulness of a lubricant for a specific purpose, but if any one property is more valuable than another as a criterion it is the viscosity.

**Viscosity.** Strictly speaking, viscosity is the resistance to the sliding of the particles of a body on each other or the resistance to shearing; but in connection with liquids it is usual to consider that viscosity is the inverse of fluidity. For example, molasses, which is less fluid than water, is said to be more viscous. Likewise cold cylinder oil is more viscous than dynamo oil. If equal quantities by volume of various oils be poured in turn through a clean funnel it will be noticed that the rate of flow is not the same for all. The difference is mainly due to difference of viscosity. Some lubricants at low temperatures, such as greases, have apparently no fluidity and consequently an infinite viscosity, but sufficient pressure reveals that all substances are somewhat fluid even at ordinary temperatures. The operation of making lead pipe illustrates the point.

The unit of viscosity as commonly used is the time in seconds required for a definite volume of the oil to flow through an orifice of definite size. The writer uses as such unit the time in seconds required for 100 cubic centimeters of the oil to flow from a glass pipette known as the Pennsylvania Railroad viscosity pipette.



Thus, if 100 cubic centimeters of a dynamo oil requires 60 seconds to flow from the pipette mentioned, the viscosity is said to be 60 seconds.

It should be noticed that viscosity is not a fixed property, but that it varies greatly with the temperature conditions. Thus cylinder oil and cup grease are very viscous at ordinary temperatures, but become less so at higher temperatures and are very fluid when in use for their respective purposes. Fig. 1 shows

## COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION.	MONTH.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.					Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel per k. w. h.	Price of Fuel per Ton of 2,000 Lbs.	Kind of Fuel	
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.							Total.
1.....	May	1,357,424	.303	.168	.031	.028	.044	.574	4.5	.8	9.	2.89	\$2.10	Bituminous.
3.....	"	230,349	.434	.249	.040	.009	.004	.736	4.5	4.0	.....	4.08	2.13	"
4.....	"	200,565	.367	.220	.037	.007	.031	.662	3.78	3.35	.....	3.40	2.16	"
5. Metropolitan Elevated, Chicago.	"	1,468,384	.310	.155	.010	.023	.040	.547	5.4	1.8	6.28	3.51	1.78	"
6.....	"	514,160	.751	.253	.100	.....	.270	1.374	.....	.....	.....	2.78	.....	Oil.*
8.....	Apr.	882,832	.534	.228	.050	.....	.020	.841	.....	.....	.....	.....	.....	"
8.....	May	910,960	.332	.241	.078	.....	.045	.686	.....	.....	.....	.....	.....	"
9.....	Apr.	210,565	.498	.412	.034	.....	.080	1.024	.....	.....	.....	.....	.....	"
9.....	May	267,700	.518	.343	.104	.....	.056	1.024	.....	.....	.....	.....	.....	"
10. Metropolitan, Kansas City, Mo., Central Av.	Feb.	306,823	.308	.147	.005	.003	.018	.481	1.8	2.1	.....	5.01	.....	Bituminous.
10.....	Mar.	340,482	.247	.135	.010	.010	.024	.426	1.38	2.26	.....	3.96	.....	"
10.....	Apr.	314,673	.316	.147	.012	.003	†.027	.507	1.49	2.45	.....	5.13	.....	"
10.....	May	331,166	.214	.136	.002	.005	.008	.365	1.45	2.39	.....	3.51	.....	"

\*\$5.07 cents per barrel.

†Miscellaneous, .002.

graphically the great variation in viscosity of a good grade of engine oil which the writer has tested. Within the limits of temperature shown, from 75° F. to 125° F. the viscosity varies from 102 seconds to 60 seconds. The experiments were made with the pipette referred to above.

Fig. 2 exhibits the viscosity curves of the same engine oil as above, the curve A being for the clean unused oil and the curve B being for the same oil after it had been in use some time in a self-oiling bearing.

Fig. 3 shows graphically the viscosities which might very readily be obtained from two different oils of the same class. At about 95° F. the viscosities are identical, but a marked divergence exists at other temperatures both above and below. Evidently the results of determinations at but one temperature might be misleading as to the relative merits of two or more oils in question.

Viscosimeters. As already stated, the viscosity of an oil is usually obtained by observing the time required for a given volume to flow from an orifice of given size. In practice most viscosimeters are simply vessels of metal or glass having an aperture near the bottom for the escape of the oil. The measurement of the volume of the oil is accomplished by graduating the vessel so that its volume between two levels is known or by receiving the oil in a graduated cylinder or a cup of known capacity. Frequently the vessel is surrounded by a jacket in which hot water or oil or ice can be placed for the purpose of maintaining any desired temperature of the oil being tested. Much ingenuity has been displayed in the design and construction of viscosimeters and it is now possible with the best instruments to obtain results of great accuracy. But such instruments are expensive, usually difficult to keep clean and require great care in manipulation. After a considerable experience and observation of the various viscosimeters the writer has reached the conclusion that a pipette viscosimeter has sufficient accuracy for ordinary uses where only relative results are required and possesses in addition the recommendation of being inexpensive enough to be within the reach of anyone who really wishes to know something about the oils he is using. Relative results are in most cases all that are required; the problem which is to be solved with a viscosity test is one involving the comparison of two or more oils of which for the time being one is the standard.

The Pennsylvania Railroad viscosity pipette, being made and graduated with care and with special reference to its use, is the

best pipette for viscosity tests. Being of glass they are fragile but ordinary care will prevent accident. If broken the instrument can be replaced with another which will give substantially the same results as the first one. These instruments are made and sold by Bullock & Crenshaw, Philadelphia.

Fig. 4 shows the viscosity pipette arranged for a test. A is the pipette, an elongated glass bulb with the ends drawn out into tubes or stems, the lower stem being still further drawn out at the bottom to form a conical aperture of standard size for the escape of the oil. On the stems at B and C near the bulb are two marks or scratches, between which within the bulb is a volume of 100 cubic centimeter at 100 degrees F. The pipette is held by a clamp D secured to the vertical rod E. Over the end of the upper stem is slipped a small rubber tube F about two feet long, provided with a pinch cock G. Below the pipette is a cup, H, holding from a pint to a quart of the oil to be tested. In the oil hangs a thermometer, K, from a wire bracket wrapped around the rod E. A watch, preferably a stop-watch, completes the outfit.

The instrument is used as follows: Heat the oil in the cup H to a temperature higher than the highest for which a determination of the viscosity is desired. This heating is conveniently done by placing the cup with its contents in boiling water or hot oil, or by setting the cup on the steam chest of an engine. Having heated the oil as directed above, place the cup so that the lower end of the pipette dips into the oil about an inch. A block under the cup will accomplish this readily.

Stir the oil thoroughly with a thermometer or otherwise and note the temperature by the thermometer. Put the free end of the rubber tube in the mouth, loosen the pinch cock and by suction with the mouth draw the oil into the pipette until the upper surface of the oil ascends to a height of about two inches above the mark C. With care there is no danger of drawing the oil over into the mouth. Lower the cup H so that the oil escaping from the orifice will fall freely in air. Close the pinch cock and drop the rubber tube. Open the pinch cock and with the watch note the exact time at which the surface of the oil passes the mark C, and later the exact time of passing the mark B. Stir the oil thoroughly and note its temperature by the thermometer, as before. This temperature will be lower than the one first observed owing to radiation from the bulb and stems of the pipette and from the cup H. The mean of the two readings is taken as the temperature of the oil for the test. The error thus introduced is unimportant if the several steps above outlined are taken rapidly, as can easily be done after a few tests. The difference in the time readings reduced to seconds and fractions is the viscosity for the temperature above mentioned. Subsequently, during the cooling of the oil down to the temperature of the room as many determinations of the viscosity may be taken as is desired, and from the values obtained a table and viscosity curve may be

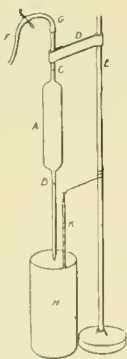


FIG. 4.



constructed. Herewith is presented a table showing a set of observations by the writer using the pipette for a viscosimeter.

## VISCOSITY OF "B" ENGINE.

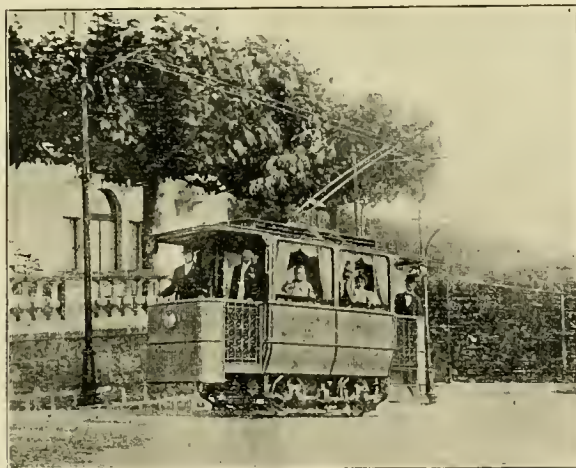
Determination Number.	Temperature Before.	Temperature After.	Temperature Mean.	Viscosity Seconds.	Remarks.
1.....	126.5	124.6	125.5	60.6	
2.....	116.5	115.7	116.1	61.	
3.....	109.8	108.8	109.3	68.	
4.....	104.	103.4	103.7	97.	Stoppage of orifice
5.....	102.5	101.5	102.	71.	
6.....	97.5	96.	96.7	76.2	
7.....	88.5	87.	87.7	84.4	
8.....	83.5	83.	83.2	90.6	
9.....	79.2	78.8	79.	96.2	

From the data in this table the curve B, Fig. 2, was plotted. Aside from the watch the cost of the apparatus for viscosity tests according to the above method need not exceed \$3. The pipette should be kept scrupulously clean.

## POLYPHASE TRAMWAY IN FRANCE.

In two or three places in Europe the experiment of operating electric cars by alternating current motors is being tried, but it is rather strange that in each case the line is very short. We are indebted to "Engineering," of London, for the description and illustration of the new polyphase tramway at Evian-les-Bains, France.

The Hotel Splendide, a fashionable resort on the southern shore of the Lake Geneva in French Savoy, is situated about 20 yards above the Avenue des Sources, in which the visitors take the waters. In order to save their guests the climb back to the hotel, the Société Anonyme des Eaux Minérales resolved, on the suggestion of Lombard-Gérin & Co., of Lyons, to build a small electric adhesion tramway as the most convenient and pleasant means of conveyance. The tramway is only 300 yds. in length, but is not without interest. Polyphase currents were selected because the power station supplies such, and on account of the special advantages which polyphase motors offer in this case, namely, simplicity in construction and the ease with which such motors auto-



POLYPHASE TRAMWAY IN FRANCE.

matically check themselves running down grade without requiring any brake.

The track has the appearance of an S, and is formed of double Vignoles rails on steel sleepers. It is a single track without switches or sidings. The average grade is 8 per cent and the maximum, 10.2 per cent, occurs on the sharpest curve of 49 ft. radius. The gage is 1.1 meter (43.3 in.). The current is taken from two copper wires, 1/4 in. in diameter, strung 12 in. apart on the brackets of ornamental tubular steel poles. The rails, with their copper bonds, serve as return conductors. The power sta-

tion of the Cevenos Electricity Works, 8 miles from Evian, generates currents of 5,200 volts being used both for light and power. A transformer for 30 k.w. at Evian reduces the voltage down to 200 volts for the tramway, and for a 6-h. p. motor of the hydraulic elevator of the hotel. The one motor car rests on a light truck with two axles. The car weighs nearly 4 tons and has accommodation for 14 passengers, eight of whom find seats. It is handsomely wainscoted and decorated in light maple, mahogany, and black stained pear tree wood; the seats are made of bent beechwood, also stained black, and cane. Chamois colored curtains hang before the large plate glass windows. All metallic parts are heavily nickelled. The floor is covered with rubber, over which Oriental carpets are spread. There are two incandescent lamps for the interior of the car, and two colored headlights.

The 15-h. p. polyphase motor can temporarily develop 25 to 30 h. p. The shaft makes 750 r. p. m.; the conductor is stationary; the starting resistance with its hard steel contact rings and brushes belongs to the armature circuit. The gearing comprises an auxiliary shaft and toothed wheels and chains driving both axles. Each platform is provided with a simple starting device and an emergency current interrupter. Current is turned on in the same way for running up and down hill, and the start is always easy and the motion uniform. When descending, the motor attains a speed somewhat in excess of the speed which corresponds to synchronism; it then acts as a generator, and sends current back to the mains. The car carries two trolley poles. One of the trolleys may therefore leave the wire without causing trouble, as the motor would continue to run as a monophaser motor, and to act as a brake. When both trolleys jump, the hand-brake is applied to both wheels.

The simple sandbox deserves mention. It consists of two concentric cylinders. The outer one is stationary, and is provided with funnels and discharge pipes. The inner cylinder contains the sand, and has a longitudinal slot which is normally on the top of the cylinder. When the lever is turned, sand falls into the funnels; on letting go, the cylinder returns to its normal position. The little tramway was opened for traffic in June, and has worked with complete satisfaction since, making on an average 60 double trips daily, at a speed of 6 miles per hour both up and down.

## AURORA ENTERTAINS THE ILLINOIS ASSOCIATION.

When the Illinois Street Railway Association adjourned after holding its first regular meeting last spring, it was suggested that as many of the members never attend the national convention, and as seldom find an opportunity to extend their acquaintance with the other members of the work in this state that it would be an extremely pleasant and profitable thing to spend a day together. Aurora promptly extended an invitation and the gathering occurred on September 20. Maj. D. A. Belden, general manager of the lines in Aurora, was the host and royally entertained his visitors. No attempt was made in the way of an extended formal program of papers, but a most enjoyable exchange of experiences was had, and after a fine dinner served by Maj. Belden, the entire party made a tour over the road in a special. The trip up the Fox river on the Aurora & Geneva, which is on the line to Elgin, is one of the most picturesque in the state, and a more perfect roadbed certainly cannot be found. As one visitor remarked it was more like sliding than riding.

A REVIEW representative visited the shops of the C. W. Hunt Company, at West New Brighton, Staten Island, and found them running to the full capacity. On account of the increase in orders for coal handling machinery, a new machine shop, 98 by 130 ft., is being erected.

The St. Catharines & Niagara Central, a short steam road, has been purchased by Haines Bros., of New York. It is proposed to operate the line by electricity and put it in first-class condition. The trip between the two cities will be made in 40 minutes.

## W. H. HEULINGS, JR.

The marriage of William Henry Heulings, Jr., of the Brill Company, to Miss Grace Lucille Vane, of Philadelphia, is announced for October 19, and Mr. Heulings is receiving the best wishes of his many friends.



W. H. HEULINGS, JR.

Mr. Heulings has been with the Brill Company for just half his life, first engaging with the company when but fourteen and one-

if years of age. He had made a study of stenography after leaving the grammar school, expecting it to be of assistance to him in his college course. A college education was one of his ambitions and he was on his way to enter the University of Pennsylvania when by accident he met his instructor in stenography, who persuaded him to temporarily take a position with the Brill Company, until a man could be fitted for the place. Thus began his business career, and acting on the advice of Mr. Rawle, now

treasurer of the company, he decided to postpone his college course for a time, and now rather ruefully admits that the "time" has not yet come.

When taking his position he was entirely alone, and Mr. Heulings attributes his success largely to luck, but we who are not prevented by modesty from telling the truth know that his rise with the company was due to his integrity, untiring industry, studious application and ability—from the first he made himself generally useful and availed himself of every opportunity to advance the firm's interest, and usually with success. Mr. Heulings consoles himself for the lost college course by remembering the fact that he has been associated with the "cleverest, cleanest cut and most pleasing business men who ever joined in one enterprise."

Miss Vane was formerly of Chicago, but for five years past her family has lived in Philadelphia. She is the daughter of the late Atwood Vane, of St. Louis and Chicago, the founder of the Vane-Culvert Paint Company, of St. Louis. Mr. Heulings is descended on his father's side from original New Jersey settlers; his mother was Margaret A. Pue, daughter of Hugh A. Pue, a well-known and influential Philadelphian.

Mr. and Mrs. Heulings will be at home after December 4, at 4820 Cedar avenue, one of the most beautiful resident districts in the city, and will be glad to there welcome their friends.

## PERSONAL.

L. D. Nelson, of the Sterling Supply & Manufacturing Company, was a REVIEW caller when in Chicago recently.

E. P. Shaw was unanimously renominated for treasurer and receiver-general by the Massachusetts Republican state convention, on October 6.

M. M. Broadwell, one of the promoters of the Union cable line at Kansas City, which failed to go through, has been placed under restraint, his mind having failed.

Mark Cummins, general manager of the Janesville (Wis.) Street Railway Company, has resigned that position and will remove to South Bend, Ind., to take up similar work.

A. L. Gillette, formerly electrician for the Terre Haute Electric Railway Company, has gone to Marinette, Wis., to take a similar position with the Light & Power Company.

Ferd Green, of Janesville, Wis., has been appointed superintendent of the Janesville Street Railway Company. Mr. Green has been connected with this road for over two years.

W. G. Price, formerly mechanical engineer of the Chicago City Railway, is now superintendent of the Peckham Motor, Truck & Wheel Company's shops, at Kingston, N. Y.

C. Densmore Wyman, general manager of the New Orleans Traction Company, paid the REVIEW a visit on his return from the Boston convention. He also spent a week in Milwaukee, where he has hosts of friends.

Louis H. Mountney, formerly general manager and superintendent of the Wissahickon Electric Passenger Railway, Philadelphia, has been appointed superintendent of the Portsmouth Street Railway, Portsmouth, Va.

J. W. Mauck, of Chicago, has been chosen treasurer of the Chicago & Milwaukee Electric Railway and will be the active head of the company. Mr. Mauck is a brother-in-law of Mr. Frost, the vice-president of the company.

The many friends of S. Potts, formerly chief engineer of the West Chicago Street Railroad, will be interested to learn that he has a very fine position as chief engineer of the lines at Saltillo, Mexico, where mules are being replaced by the trolley.

E. W. Davis, formerly superintendent of the McKeesport & Reynoldton branch of the Union Traction Company, Pittsburg, has been appointed general manager of the Versailles Traction Company's road, connecting McKeesport and Versailles.

C. O. Simpson, assistant auditor and paymaster of the Metropolitan Street Railway Company, of Kansas City, leaves the company after nine years of service to become auditor of the Augusta (Ga.) Railway & Electric Company, succeeding the late C. B. Reavis.

Stanley Green, formerly western manager for the Fuel Economizer Company, of Matteawan, N. Y., with headquarters in Chicago, is now traveling representative of the Standard Carbon Company of Cleveland, for the states of Missouri, Iowa, Kansas and Minnesota.

C. W. Register, an able member of the engineering staff of the Westinghouse Electric & Manufacturing Company, in the Chicago territory, is receiving the congratulations of his many friends on the occasion of his marriage to Miss Lillian A. Hoffman, of this city.

T. W. Shelton, who recently resigned as superintendent of the Mahoning Valley Railway Company, of Youngstown, O., to go to Indianapolis, was called to the power house on the eve of his departure, where he found the employes of the company, who presented him with a handsome traveling set.

Alfred Wallace is again in charge of the street railway at Columbia, Ga., resuming the position of superintendent which he has held from the time of the establishment of the road until a few months ago, when he resigned to take up other business. Mr. Keeler, who took his place at that time, resigned to go into business elsewhere.

H. M. Sloan, general manager of the Calumet Electric Railway, Chicago, was highly honored in an invitation from Capt. Bowman H. McCalla to dine with him. The Marblehead anchored in Boston harbor at 4 p. m., on the Monday following the convention, and at 5 o'clock Mr. Sloan with the captain and his family were seated around the table in the officers' dining room. Mr. Sloan lost his convention badge, which was exchanged for one of the Marblehead buttons.

J. H. Moffitt, general manager and purchasing agent of the Syracuse (N. Y.) Rapid Transit Company, resigned on October 1. Mr. Moffitt's relations with the company have been most harmonious, and he resigns in order to go into business in Syracuse after taking a much-needed vacation. C. Loomis Allen, assistant



general manager, succeeds Mr. Moffitt with the title of acting general manager; Mr. Allen has been with the company for four years and was the engineer in charge of the construction and reconstruction work.

## OBITUARY.

C. W. McElyea, owner of the line at Cedar Falls, Iowa, died on Sunday, September 18.

Carlos A. Cook, long connected with the North Chicago Street Railroad, died at his residence on September 27, at the age of 70 years.

Carlton G. Haydon, cashier of the Louisville City Railway Company, died at his home in that city on September 17, after a lingering illness. Some two years ago Mr. Haydon had an attack of typhoid fever, from the effects of which he never fully recovered. He was well known in the business community, having been with the railway for 17 years, and had a great many friends who mourn his loss.

## NEW PUBLICATIONS.

The use of alternating current apparatus is becoming very extensive as great water powers are being developed. The Westinghouse Electric & Manufacturing Company has issued a circular entitled "Quarter of a Million Horse Power of Polyphase Electric Transmission Apparatus," giving illustrations of the various types of machines and lists of installations in this and other countries.

"American Trade in India" is the title of the latest report by the Philadelphia Commercial Museum. Many instructive statistics are given relative to India as a field for commercial activity. The foreign trade of the country is analyzed and it is shown that while at present the United States is interested in only 1.6 per cent of the \$600,000,000 of foreign trade there are great possibilities and many inquiries are now coming from India. There are two steamship lines direct from New York going through the Suez canal to India.

"Street Railway Roadbed" is the title of the latest and most complete treatise on that subject. The authors are Mason D. Pratt and C. A. Alden. The book is divided up into 11 chapters, under the following headings: Early types of rails, the development of the girder rail, what governs the shape of rails, the T-rail adapted to street railways, track fastening and joints, special work, guard rails, advantages of spiral curves and tables for same, design of special work, surveys and laying out of work, and specifications. It is a book of 135 pages, with 157 illustrations, and is published by the Street Railway Publishing Company, New York.

"Poor's Manual of Railroads" for 1898, the 31st annual number, which we have received from the publishers, through A. C. McClurg & Co., Chicago, is 130 pages larger than the edition for 1897 and covers the statements of about 4,300 corporations; the use of smaller type makes the 1,346 pages of this volume the equivalent of nearly 2,600 pages set in the brevier that was formerly used. Of steam railroads there are presented statements of 1,951 companies; 1,782 in the United States, 152 in the Dominion of Canada and 17 in Mexico. The department of city and suburban railways, comprising electric, cable and horse railroads, is covered by 1,187 corporate statements and contains every item of information respecting these important enterprises. The total length of the lines in the United States equals 16,089.87 miles against 15,956.13 miles in 1896 and 13,176.38 miles in 1895, the latter sum being an increase of 3,514.32 miles over those in operation in 1891, so that in six years there have been built 6,427.81 miles of city and suburban tramway lines. The extent and thoroughness of the "Manual" are known wherever there is interest in our railway system. The labor involved in its pro-

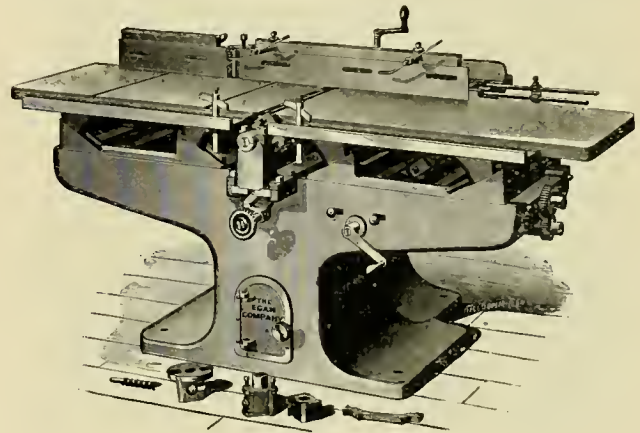
duction is not so easily comprehended; but the promptness with which it is issued annually may be appreciated by examination of the dates on which the Interstate Commerce and State Railroad Commissions' report are usually issued.

## A CAR SHOP NECESSITY.

One of the greatest necessities for a car shop where a full line of machinery is not installed is a machine to which a man can go and do almost any kind of a job, or special class of work, and do it to advantage. The machine illustrated is one designed to fill just this place in a car shop, capable of either heavy or light work. It is built by the Egan Company, of 322 to 342 West Front street, Cincinnati, and known as the No. 2½ universal wood worker. This company has achieved a world wide reputation for its wood working machinery, and the name is a guarantee.

The machine illustrated is matchless in its simplicity and ease of adjustment and in the immense variety of work that it will handle well deserves the name universal.

The column is one complete casting cored out, heavily braced and with ample floor space, insuring steady running, free from vibration when the mandrels are running at high speed. The



EGAN NO. 2½ UNIVERSAL WOOD WORKER.

tables are of extra width and length, planed perfectly true, and made with wide grooves to secure the gaining and planing frames, and exactly at right angles to the cutter head. Either table can be raised and lowered independent of the other, or can be raised or lowered together on a circle of the head, or straight up and down. All of these adjustments are made from the working side of the machine close to the cutter head, which allows the operator to make the necessary adjustments without going to the end of the machine. The mandrels are of the best quality of steel, running in self-oiling boxes, lined with best genuine babbit metal. The main mandrel is of large diameter, with the pulley running between the two back bearings. The front bearing is adjustable and can be taken off instantly when a change of heads is desired. This mandrel is also fitted up with patent adjustable bearings, by which the boxes, with mandrel and head are moved back and forth across the b. d. as desired, instead of making the adjustment by means of the fence, which will be found a great advantage and a great saving in time. The patent beveling fences are made to adjust across the tables. One fence placed over the main head, and one back of the upright head. Both are made with sliding plates and when leveled, the lower part is close to the tables and so constructed as to have no forward motion. It is also arranged to take in posts and springs for holding down the stock while being passed over the cutter head. The boring attachment on the opposite side is perfectly independent in operation. Two men can work the machine at one and the same time, without any interference. It is capable of doing all kinds of boring, routing, rosette making, dovetailing table slides, and a general run of this kind of work.

## A BOOK FOR MOTORMEN.

There has long been a recognized demand for a hand book for motormen which would give in such detail as is impossible, in the regulation rule book, an illustrated description of the mechanical construction of the motors, controllers, etc. One or two attempts have been made, but thus far nothing has come from the press which seemed to meet the requirements. The STREET RAILWAY REVIEW is, therefore, now issuing such a work, and in the three weeks since its publication the sale has been large, and is increasing daily.

In the preparation of the work, the fact was recognized, first, that it must be so worded as not in any manner to conflict with the established rules of any road which might wish to distribute the book among its men. This principle has been carefully followed out, and the work carried along such lines as to accomplish the end in view without incurring any conflict whatever. It does not aim to educate the motorman with a view to making him feel that after studying it, he is qualified to undertake repairs on his own account. On the contrary, particular stress is laid upon the mischief and damage which almost certainly follow any attempt on his part to tinker with the apparatus. But on the other hand, it is assumed that any man, however satisfactory a workman he may be in the management of his car, can be still further improved by a practical understanding of the mechanical and electrical processes which occur in the various handlings of his car. He is shown not only that under certain conditions of starting there is a wasteful use of current, which costs money at the coal pile, but he is also shown why it is wasteful, and the lesson impressed upon him that in the course of days and months this needless waste assumes large proportions. A good workman ought to do as he is instructed, whether he knows the reason for so doing or not; but it is at the same time an indisputable fact that even the good workman will be still more careful and saving when he fully understands the loss which carelessness on his part may cause.

The book has been written in simple language which any man who is competent to operate a motor car should easily be able to comprehend, as the writer has carefully avoided terms and phrases which involve a technical knowledge of electricity. In fact, one manager is so well pleased with the work he has ordered a large supply, and will henceforth require his applicants for position of motormen to pass an examination on the book, holding that one who cannot do so is not up to the standard of men he desires for that work.

The book is divided into two parts, the first of an elementary character, and the second a little more advanced, but readily understood after reading the first portion.

We are convinced that men who would study the work before applying for a position would, by so doing, thus prepare them-

selves to a great extent to understand the instructions which follow their employment and thus prove vastly better men for their company than they possibly can to commence in the dark and pick up a little here and there as time goes on. The book is fully illustrated, and having been written by a practical electrical engineer, who has had long experience in handling new men, has thus been able to get right at the essence of the subject while keeping the text within the bounds of simplicity and treating the subject in a very practical manner.

## H. P. BRADFORD IN MEXICO CITY.

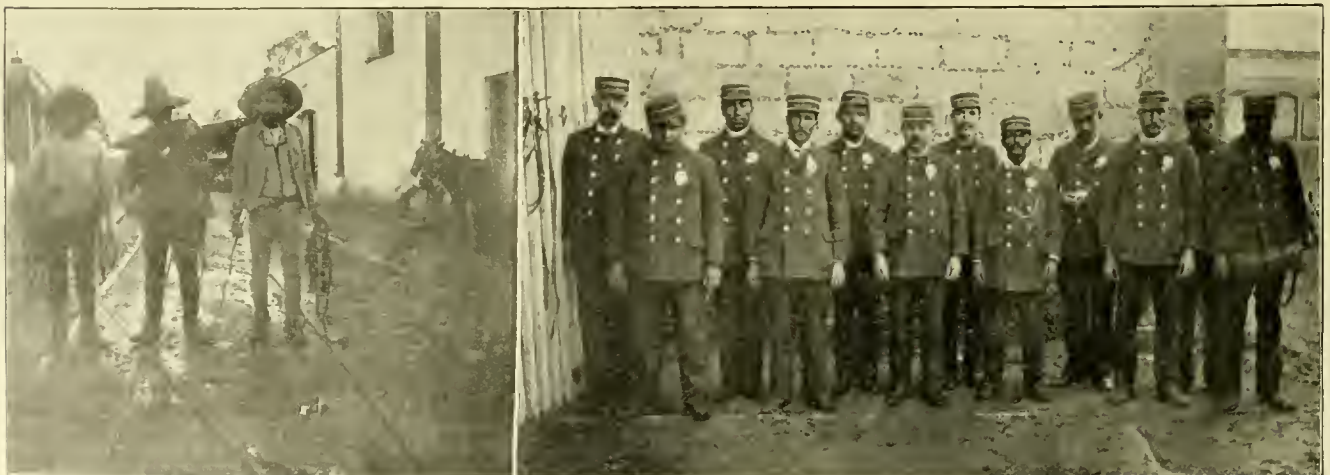
H. P. Bradford, recently of Cincinnati, but whose reputation as a street railway man extends far beyond the borders of Ohio, and who rarely misses a convention, did not attend the Boston meeting. He was too busy running mule cars and building an



H. P. BRADFORD.

electric line in the old city of Mexico, where he is general manager of the large system of tramway and steam dummy lines. He is meeting with very gratifying success, the net earnings having increased to an average of \$20 000 per month, with a good reduction in expense, and with increased car service. The long, pointed, picturesque sombrero which covered the driver clad in grotesque garments and armed with a whip and horn, has now given way to the more prosaic but neater uniform general in "the states," and the innovation, while now more satisfactory to the public and the men, at first excited no end of comment and opposition. One of the illustrated papers of the city printed a full page cartoon, which we reproduce, and which is "dedicated to the Yankee manager." The "ayer" (yesterday); "hoy" (today); and "manana" (tomorrow), indicate the evolution respectively of the mule, the driver, the conductor and the inspector. In the last stage it will be noticed the mules have also donned the regulation suit, and the foot-note explains that the smoked glasses are to enable all to see alike. Mr. McLean had already uniformed the conductors before he left.

Mr. Bradford is a native of Memphis, where he was born in 1856, and has been in street railway work all his life, first as contractor and later as general manager and president of lines at Little Rock, Cincinnati, and elsewhere. He served acceptably



CITY OF MEXICO: DRIVERS BEFORE AND AFTER UNIFORMING.



on the executive committee of the American Street Railway Association last year. He is now constructing the first electric line in the City of Mexico, which will be running in about six months, commencing with 36 cars, and which will be expanded

## En los Ferrocarriles del Distrito.

LA UNIFORMIDAD DE LOS UNIFORMES, TRAÍDOS POR LA EMPRESA TANQUE.



eventually to displace all the present motive power. An 80-lb., 3/4-in.-groove rail will be used; the power house will be iron and stone. The electrical work is in charge of the company's engineer, A. E. Worswick.

## CHICAGO SOUTH SIDE ELEVATED.

The traffic on the South Side Elevated Railroad, Chicago, for the past two years is as follows:

Months.	1897-98.	1896-97.	Inc.
November .....	54,295	36,982	17,362
December .....	56,425	39,848	16,577
January .....	52,117	35,290	16,827
February .....	52,682	35,737	16,945
March .....	54,827	35,515	19,312
April .....	54,148	34,733	19,415
May .....	49,458	32,803	16,655
June .....	45,427	29,612	15,815
July .....	44,148	27,061	17,087
August .....	41,770	27,074	14,696
September .....	46,576	30,067	16,509

This road began using the Union Loop October 19, 1897.

The Wheeling (W. Va.) Railway Company has installed a new 1,000-h. p. engine and generator.

Frederick Uhlmann, receiver of the Brooklyn Elevated Railroad Company, is reported as saying that the reorganization of the company will be completed within 30 days, when a new name will be adopted.

## THE NEW MEAKER REGISTER.

The Meaker Manufacturing Company, of North Chicago, has recently placed on the market a new stationary fare register which provides an additional check on the conductor, enables the manager to check the bookkeeping at the office and at the same time shuts out the general public from a knowledge of the business. The illustration shows a view of this register, which has a totalizing capacity of 100,000, with a trip capacity of 1,000, but the first place on the totalizer has letter symbols instead of figures so that it can be read only by the one knowing the meaning of the letters. The figures are 1-16 in. high, white on a black ground, and can be plainly read from any part of the car.

The mechanism is positive in its action and perfectly inter-locked, so that even with the case removed neither the totalizer nor trip figures can be moved, nor the bell rung except in the regular way. The register can only be assembled with the figure nines at the window position, and hence it cannot be taken apart and put together at a lower number. There are but three springs



THE NEW MEAKER REGISTER.

in the entire machine. All the steel and iron parts are made rust proof by a new and satisfactory process; the wearing parts are all made of phosphor bronze, or rust-proof steel, a new departure in register mechanism. Dust is most carefully excluded from the interior, a separate chamber being provided for the bell, which requires sound openings.

Another feature is that the too rapid ringing of the register is prevented by a long pull stroke. It can be operated as fast as can be easily counted, but no faster.

The trip part of the register may be set back to zero at any time by one turn of the thumb button at the right, which must be pulled out before it can be turned. When this shaft is pulled out it cannot be pushed back, and as it is pulled across the operating slide, the main register cannot be operated in any way until the return to zero has been made and the thumb button returned to its normal position. The trip direction sign is changed by the same operation.

When registering the changing figures in both numbers are covered by red shutters until the bell rings.

Like all the earlier Meaker registers, these are models of good workmanship and their desirable qualities will doubtless secure for them an even wider use than the other types.

When a trolley line was opened from Plainfield to Dunellen, N. J., last month, Mayor Brakely, of Dunellen, inaugurated a new custom in the railway business and following the nautical fashion broke a bottle of wine over the dashboard of the first car sent out.

## DEATH FROM TROLLEY WIRE.

In the early days of the trolley the daily papers devoted pages to the awful slaughter which was sure to follow the erection of trolley wires in public streets. As time passed, however, the fact asserted itself that while a severe shock could be had by contact with the 500-volt direct current, it was not fatal. There were several cases where linemen, for instance, were shocked and losing their hold on the pole fell, and died from the result; but we fail to recall a single instance of this kind where it was positively established that the shock and not the fall produced death.

Our readers may recall an interesting account in the June, 1894, Review, where a boy in St. Louis succeeded in getting a wire over the trolley wire, and who, after winding the ends around his wrists, stepped on the rail in the endeavor to receive a shock. He did, and by the time the neighbors came and removed him from the track he was dead. We believe this case has been the only one of its kind.

A genuine case of death from the trolley current, however, occurred on September 2, at Macon, Ga., the particulars of which are as follows:

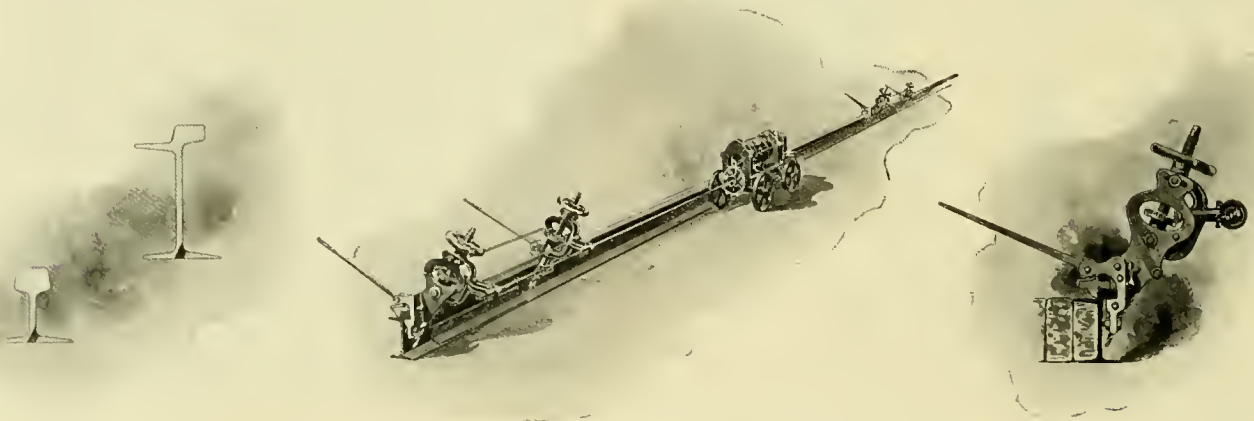
H. N. Burke a conductor, was instantly killed by contact with a guard wire crossed on the trolley wire. The car of which he was in charge was proceeding during a severe storm of rain

about the size of a silver dollar. The statement in some of the papers, that the man died in great agony, calling for help, is all a mistake, as he never uttered but one sentence, and sank to the ground dead."

It is difficult to explain why the deceased should have been so regardless of safety as he had been in the company's employ some two years, and was, moreover, a graduate of a southern school where electricity is taught. The conditions were certainly almost perfect for receiving the full shock, but it would seem to us that, even under these circumstances, the man must have had a weak heart or other vital weakness, for there are cases without number where the 500-volt shock has failed to produce more than temporary discomfort.

## SOME POINTS ON RAIL BONDING.

The necessity of good rail bonding is now appreciated, and much attention has been given to securing bonds of ample size to carry the return current. Less consideration has been given to the methods of application and this has been a fruitful source of trouble. The Harrington Rail Bonding Company has solved this difficulty in its system of diagonal bonding. The bond consists of four copper wires, rolled into terminals  $\frac{3}{4}$  in. in diam-



METHODS OF APPLYING THE HARRINGTON RAIL BONDS.

and wind which had raged for hours, and the man himself had been out four hours and had become thoroughly drenched from head to foot. About 10 o'clock at night the motorman noticed a guard wire hanging over the track and stopped the car. Conductor Burke went ahead and seized one end of the guard wire (the other end rested on the ground), in spite of the fact that it was sparking furiously. He gave one exclamation, and before the motorman, who was only six feet away, could reach him, was dead. The motorman, with the assistance of a passenger, tried to remove the wire from the man's hand by means of a rope, but the death grip was so firm it could not be done. They did succeed, however, in freeing the guard wire from its contact and stopped the flow of current.

A gentleman interested in street railway matters, who happened to be in the city at the time, and who made inquiries regarding the accident, says:

"This accident would seem to explode the theory so long entertained by many of us, that a 500-volt direct current is not necessarily fatal, for this man was killed almost instantly. I wish to say, however, that the conditions could not have possibly been more favorable if they had been pre-arranged, than they were on this occasion. In the first place, the man was thoroughly wet, having been out in a soaking rain for hours; in the next place he deliberately walked up and took hold of the wire with his left hand while his right foot was resting on the rail. The only marks on the body were where the wire had burned his fingers and hand, and a hole in the bottom of his right foot

eter and placed at an acute angle through the metal of the rail. As may be seen from the illustration, the hole is drilled where the web and lower flange join, affording an exceptionally large area of contact.

The company recognized that perfect bonding could not be done by hand, and drilling machines were devised to do the work quickly and accurately. The second illustration represents the drilling machine attached to the rail and the third shows the drills in position to bore holes for two bonds at the same time, the drills being driven by a small portable motor. By means of this apparatus in re-bonding, holes may be drilled, reamed and bonds put in place within two minutes. This method also requires the disturbance of less paving than any other. After the holes are drilled they are reamed to a taper of  $\frac{1}{4}$  in. per ft. The terminals of the bonds are coned to the same taper and rolled to true surface, insuring perfect contact. The "Columbia Protected" bond of the Harrington Company is widely adopted in foreign countries, as well as at home. The Middlesbrough, Stockton & Thornaby Electric Tramways, the latest and best system in England, used the "Columbia" bond exclusively.

Negotiations have been completed between the city council of Vienna and Siemens & Halske, of Berlin, whereby the city is to acquire the tramways and lease them to a new company for a term of 25 years for a rental of 40 per cent of the net receipts. All the lines are to be equipped for electric traction.



## FAKE DAMAGE WORKERS CONVICTED IN PHILADELPHIA.

September 29, two men who had attempted to defraud the Union Traction Company, of Philadelphia, by presenting fake damage claims, were convicted in the Quarter Sessions Court No. 1.

The trial revealed an interesting set of circumstances. The actors in the drama were William Myers, William H. Harris and Paul Phillips, but the latter was exonerated from any wrongdoing, and, in fact, it was due to his fidelity to the company that the fraud was discovered.

Phillips is a conductor on the South Nineteenth and Twentieth streets branch of the company, and Myers and Harris are ex-employees. Phillips' was the convicting testimony. His story was as follows: While in a down-town restaurant he met Myers, who in a general talk told him that the Traction Company was "easy," and that he had successfully "worked" the company on three different occasions by fake accident claims. Myers went on to unfold the scheme and to try and persuade Phillips to become a party thereto. He suggested that he be permitted to board Phillips' car and then "fall" off at a convenient place. A claim for damages would be presented in due course, which the company would readily settle without going into court, and the proceeds would be divided.

Phillips let on he was in sympathy with the scheme, but in-

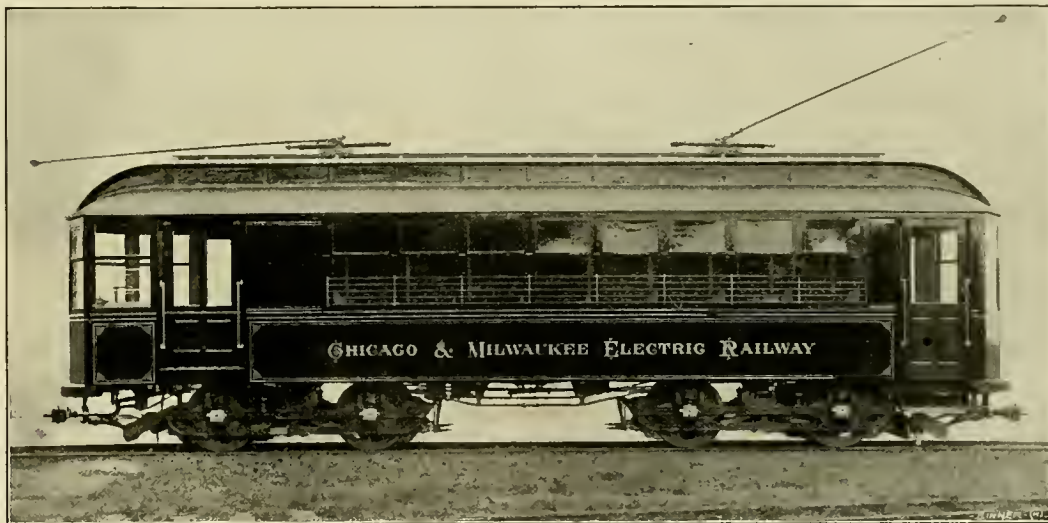
name of Charles Wilson. Myers, who "fell" from the car, kept discreetly in the background during these proceedings.

After matters had progressed thus far warrants were issued, and when arrested Harris was said to have remarked, "I expected it." In the course of his testimony Conductor Phillips said that Myers and Harris seemed to have an ill-feeling for each other, each secretly expressing his intention to get the better of the other. At one stage of the proceedings Phillips said Myers told him that he thought they could get no more than \$25 in settlement of the claims. According to Myers' arrangement he, Harris and Phillips were to get \$8 each, and the remaining dollar was to be given to Myers' mother for the use of her house as the home of the injured man, Charles Wilson.

Phillips said it was not his purpose to become a party to the conspiracy. He considered he owed it to his employers to protect them against the deception, but neither personally nor under instructions from the company did he try to lead the other two men on to commit the crime.

Neither Myers nor Harris made any statement in his own defense although in answer to questions by the court after the verdict they both insisted that Phillips had concocted the scheme and induced them to become parties to it.

Myers was sentenced to one year, and Harris to nine months in the County Prison. Phillips was jointly indicted with them, but as to him the jury was instructed to return a verdict of not guilty, which was done.



COMBINATION PASSENGER AND BAGGAGE CAR, CHICAGO & MILWAUKEE ELECTRIC RAILWAY COMPANY.

stead he reported the matter to his superiors. He was ordered to let affairs take their natural course. Some time afterward Myers boarded Phillips' car late at night, and after riding some distance he put his scheme into effect. At Nineteenth and Rittenhouse streets he stepped from the car and "fell" to the street. He directed Phillips to report the accident as having happened to "Charles Wilson, of 2210 South Clarion street," and he would get his younger brother to play the part of Wilson, as he himself might get tripped up.

After the report of the accident had been made at the office a representative of the company called on the injured man. The representative found the part of "Charles Wilson" was being assumed by Harris, who presented a rather woe-begone appearance, with his head bandaged up, etc.

The matter then came into the hands of Sterling L. Rhoads, assistant claims agent of the Traction Company. To Mr. Rhoads Harris explained the nature of his injuries, said he was prevented from following his usual labors, and expressed a willingness to settle the case for \$50, as he wanted to leave the city. After some minor details had been gone through Harris was paid \$40, compromise sum, and signed a receipt and release in the

## A FINE INTERURBAN CAR.

The Chicago & Milwaukee Electric Railway Company, whose interurban line was described in the August REVIEW, has placed in service some exceptionally fine cars. They are vestibuled cars of the convertible type, both for winter and summer use, and built to be operated at high speed. The cars are 38 ft. over all and mounted on Peckham standard 14 B double trucks, equipped with two 50-h. p. motors. The passenger coaches have seating capacity for 40, while the combination passenger, express and baggage cars, such as shown in the illustration, will seat 36 passengers besides having a compartment for express and baggage. The cars are finished in solid cherry with bird's eye maple ceiling and handsomely decorated, and are furnished with reversible rattan seats. The entire equipment is painted a royal blue with gold lettering, and the road will be known as the "Royal Blue Line." The line is completed from Waukegan to Highland Park, but the work of constructing the line southwards is in progress, so that it will ultimately connect with the Chicago systems. It is expected that a good business, carrying mail, parcels and express can be built up between the prosperous

towns and suburbs through which the line passes. This is the road of which A. C. Prost is vice-president and treasurer; and C. E. Loss was constructing engineer.

### JOHN I. BEGGS ENTERTAINS CHICAGO OFFICIALS.

On September 25 a party of Chicago street railway officials took a special car for Milwaukee, on the invitation of John I. Beggs, general manager of the Milwaukee system. They arrived at 11 a. m., and after a reception by the Milwaukee fraternity, board a special car and were taken out over the new Waukesha line to Pewaukee Lake, a distance of 26 miles. The run was made in 61 minutes, which was splendid time considering the fact that six miles were through city and town limits, and that of the remaining 20 miles scarcely any was yet ballasted, although large crews are at work and will complete the ballasting this fall. On the outward trip a delightful lunch was served on the car by a caterer in charge.

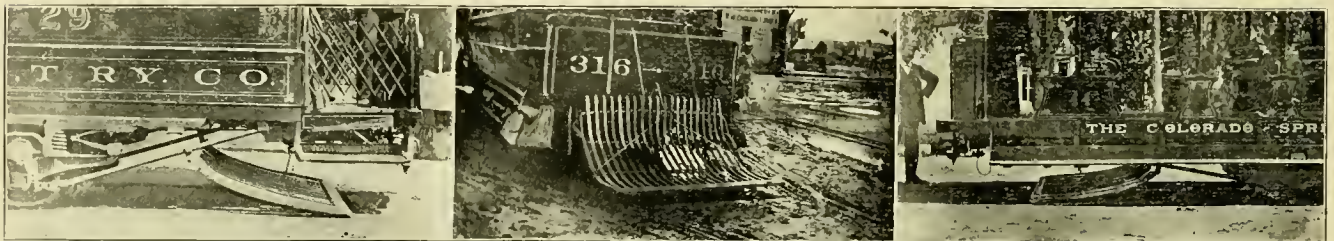
On arrival at the lake the party transferred to a chartered steamer and made a circuit of this beautiful lake, spending an hour and a half. The return trip was made in equally good time, one stretch of six miles being covered in 11 minutes, and 18 miles in 34 minutes. This too, with no feeder wires, the trol-

friends will long remember with grateful recollections, the day as one of the most delightful ever spent.

In the party from Chicago were: G. A. Yuille, second vice-president; F. L. Fuller, superintendent; Chief Engineer Carr and Master Mechanic Bridges, of the West Chicago Street Railway; T. C. Pennington, treasurer; George O. Nagle, superintendent; F. R. Greene, secretary; and A. C. Heidelberg, assistant superintendent, of the Chicago City Railway; J. R. Chapman, chief electrician, North Chicago Street Railway; H. M. Sloan, general manager and Chief Engineer Binkley, of the Calumet Electric Railway; C. L. Leeds, secretary of the Suburban Railroad; Wm. Walmsley, superintendent South Chicago City Railway; Mr. Wilson, J. C. George, and H. H. Windsor, of the REVIEW.

The Milwaukee gentlemen who met the party included John I. Beggs, general manager; H. C. Payne, vice president; T. E. Mitten, general superintendent; H. C. Mackay, auditor; G. M. Kummerlein, superintendent of transportation and O. M. Rau, chief electrician, of the Milwaukee Electric Railway & Light Company; C. F. Pfister, director in the Milwaukee road and proprietor of the Pfister hotel; Herman Falk, E. A. Wurster, A. H. Hoffman, and Superintendent Smith, of the Falk Company; C. L. Jones, secretary of the Western Gear Company.

C. D. Wyman, general manager of the New Orleans Traction Company, and E. E. Downs, of the Citizens' line, Oshkosh, were also among the guests present.



THE LAWTON FENDER AS APPLIED IN DENVER AND COLORADO SPRINGS.

ley wire supplying all the current. The car was a double truck Barney & Smith, finished in quarter sawed oak; equipped with one 35-h. p. motor on each axle, and Christensen air brake. One of the most interesting incidents of the day was on the return trip. The special was coming down the long grade, some two miles, at full speed, on a stretch of straight track 8 miles long. The regular car had dispatch order to sidetrack at the foot of the grade to let the special pass. When three miles apart the two cars were plainly visible to the occupants of each, approaching at full speed; but so nicely were the orders timed and executed that the special did not reduce speed in the least; while the regular made its switch, backed off the main line, and the switch was closed and signal given to proceed. The special was within 300 feet of the switch when the signal was made, but such was the confidence in the controlling apparatus of the car, that only admiration was expressed for the precision with which the operation was executed. Outside of city and town the line is over the company's own right of way, and is one of the best constructed lines we have ever seen.

On return to Milwaukee the party divided, some going to Whitefish Bay on a private steam yacht, and the others by special car, those going out by rail returning by water.

At 5:30 p. m. all assembled in a private dining room of the Pfister, where Mr. Beggs had ordered an elaborate dinner. An orchestra furnished music, and handsome floral decorations adorned the table. From the moment of arrival to that of final departure the daintily printed program was followed to the minute. The day was one of the finest of the year, and Mr. Beggs, who is an ideal entertainer, had planned in advance for everything which could possibly make his guests welcome, and these arrangements were carried out in every detail. His Chicago

### A COLORADO FENDER.

The fender shown in the illustration was designed and patented by Col. A. L. Lawton, secretary, treasurer and general manager of the Colorado Springs Rapid Transit Company. The cars of this company have been equipped with the fender for more than a year, resulting in an estimated saving, based on past experience, of \$20,000 in damage claims.

The fender is very simple and has proved cheap, efficient and durable. In Denver the railway companies were compelled to equip their cars with fenders, and a special committee was appointed by the council to investigate the merits of various car fenders. After a number of tests the committee reported that this fender was the best, and recommended its adoption as standard in the city.

The Denver City Railroad Company and the Denver Consolidated Tramway Company have equipped their cars with it. E. C. Baggs, general manager of the former company, wrote Mr. Lawton that the fender had given entire satisfaction on both the cable and electric cars. The fenders used by the cable company are the form which go beneath the platform of the car. C. K. Durbin, superintendent of the Tramway Company, said in a letter to Mr. Lawton: "The chief points in your fender to us are: 1. Its cheapness both as to construction and repairs. 2. Its strength and durability. 3. Its lightness, weighing about 70 lbs. We believe that you have devised an efficient, durable and economical car fender which will attract the favorable attention of street railway managers." It seems that this fender has been so favorably received at home that its merits will certainly be recognized elsewhere.



## PARSONS PRESIDENT OF UNION TRACTION, PHILADELPHIA.

The announcement was made by J. Lowber Welsh, president of the Union Traction Company, a few days before the annual meeting of the company that he would not stand for re-election either as director or president. Alexander Balfour, a large stockholder, and George W. Elkins, were both candidates for the place on the board made vacant by Mr. Welsh, but at the election on Sept. 21, they both withdrew and Mr. Welsh after considerable urging consented to again be a candidate and was re-elected as was the entire board.



J. B. PARSONS.

September 26, the board met and chose John B. Parsons president and George D. Widener, vice-president. At this meeting Mr. Welsh resigned as president and director; George W. Elkins succeeded him as a director.

The report for the fiscal year ending June 30, 1898, shows a profit of \$24,620 as against a deficit of \$851,934 for the preceding year, a result due partly to gain in earnings and partly to increased economy in operation.

The statistics of the year's business, with a comparison with the results for the preceding 12 months, are:

		Increase.
Number of passengers carried.....	238,909,353	10,836,595
Receipts .....	\$10,860,542.55	\$479,527.42
Operating expenses .....	4,456,375.26	*493,475.18
<b>Total .....</b>	<b>\$6,404,167.29</b>	<b>\$973,002.60</b>
Miscellaneous rec'ts, interest, etc. . .	110,895.04	11,264.19
<b>Total .....</b>	<b>\$6,515,062.33</b>	<b>\$984,266.79</b>
Licenses and taxes, pd and accr'd . . .	894,737.39	*18,652.16
<b>Total .....</b>	<b>\$5,620,324.94</b>	<b>\$1,002,918.95</b>
Fixed charges, paid and accrued. . .	5,595,704.36	126,363.54
<b>Net earnings .....</b>	<b>\$24,620.58</b>	<b>\$876,555.41</b>

\*Decrease.

The operating expenses amounted to 41.03 per cent of the receipts. Including licenses and taxes in the operating expenses, the proportion was 49.27 per cent.

The treasurer's statement shows that the receipts from passengers aggregated \$10,849,124.44, or 4.54 cents per passenger. The pay rolls for the year footed up \$3,349,402.38, and the operation and construction accounts required \$1,528,714.67.

John B. Parsons, the new president of the company, has been vice-president and general manager since January, 1897, and to his able management is largely due the fact that there is this year a surplus instead of a large deficit. Mr. Parsons began his street railway work in Philadelphia and remained there until 1887, when he removed to Chicago to become vice-president and general manager of the West Chicago Street Railroad, where he remained for 10 years, until he returned to Philadelphia.

We join Mr. Parson's host of friends in wishing his continued success.

The Rock River Construction Company has taken the contract to build the Rock River Electric Railway connecting Rockford, the county seat of Winnebago county, Ill., with Oregon, the county seat of Ogle county; the distance is about 20 miles.

## JEFFREY TIE HOIST.

The accompanying reproductions from photographs illustrate an important labor saving device made by the Jeffrey Manufacturing Company, of Columbus, O., which is extensively applied in the industry of preparing railway ties and putting them on the market.

This hoist is a conveyor, constructed with a roller chain carrying spurs at intervals and running in a shallow trough and consists of two sections, the first extending from the Kanawha river to the top of the steep bank, a distance of about 125 ft., and



JEFFREY TIE HOIST.

the second, from the upper end of the first, a distance of 250 ft. on the level and parallel with a railroad track.

The ties are floated down the river and gathered into a boom at the foot of the hoist, which extends into the water a sufficient distance to admit of the floating ties being placed on the spurs of the moving chain. At the top of the bank the ties are delivered to the second section automatically and conveyed to the cars on which they are loaded with but little effort.

The use of the roller chain for this service reduces the friction to the minimum and insures the long life of the wearing parts. A small crew of men can handle from 800 to 900 ties per hour. The illustrations show the incline section from the river, the loading platform with empty cars alongside and the same platform after the cars have been loaded.



## OFFICIAL REPORT OF THE ACCOUNTANTS' CONVENTION.

Secretary W. R. Brockway has issued his official, verbatim report of the recent convention of the Street Railway Accountants' Association of America and notwithstanding the fact that the report is a volume of 162 pages of small type, it went to members just 30 days from the close of the meeting.

The book contains, by vote of the association, a very handsome portrait of President Willson, which is given additional value by the personal autograph of that gentleman. The typography, arrangement, headings and classification make the report not only a most valuable collection of information and experiences, but is made available for ready reference by a most conscientious index. Secretary Brockway has certainly performed the no easy task not only in highly creditable manner, but as satisfactory as it is prompt.

Inasmuch as much of the discussion was of a nature necessarily more or less confidential it was decided not to allow its publication by the press, but it all appears in the official report and constitutes a veritable mine of information for the street railway accountant. Each copy of the report is numbered and registered to a member's name, and can only be obtained by members for their personal and exclusive use. This arrangement, while perfectly just and desirable, need not deprive any legitimate street railway from securing a copy, as the membership dues have been placed very low—\$10 per year. We do not hesitate to remark that it is an investment which will more than repay every road in the country.

On page 136 where President-elect Calderwood is escorted to the chair, he begins his remarks with the unusual salutation "Lady and Gentlemen"; this, however, is no misprint, and was a graceful tribute to the one lady member present. At the end of the report are bound in a number of inquiry blanks which may be used by members should any question arise as to how to charge any item not covered in the standard classification. These blanks can easily be filled in and when forwarded to the chairman of the permanent committee, C. N. Duffy, will receive a prompt response.

The report as a whole is a credit to the Association, but its examination cannot fail to impress the reader with the enormous amount of work performed both by the convention and its committees, but also the imperative need and large scope of usefulness of the organization.

As we go to press we learn that applications for membership have been received from the following:

- The North Hudson County Railway Company, Hoboken, N. J.
- The Milwaukee, Racine & Kenosha Electric Railway Company, Racine, Wis.
- The Metropolitan Street Railway Company, New York, N. Y.

### IMPORTANT HEATER DECISION.

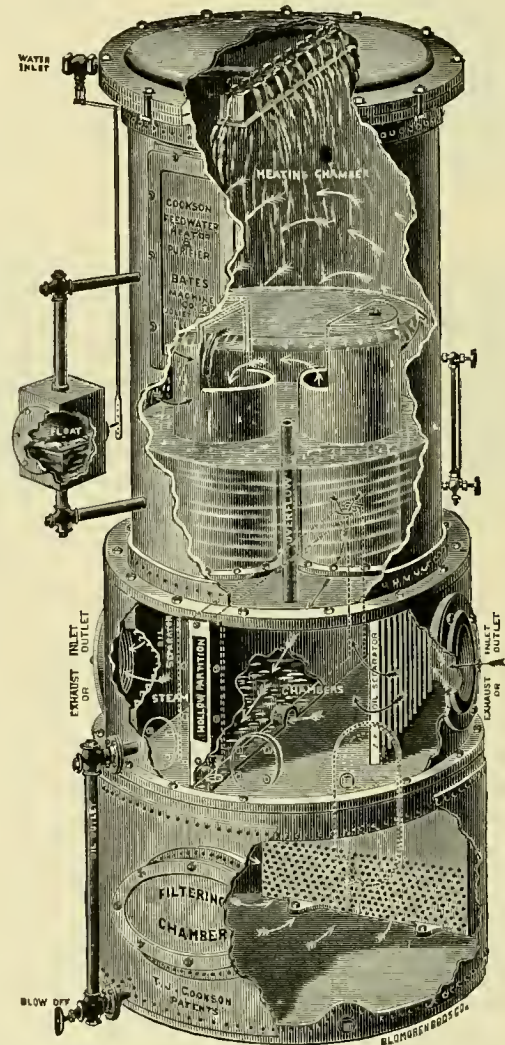
The recent decision of the United States Circuit Court of Appeals in the suit for infringement brought by the Excelsior Heater Company, of Chicago, against the Bates Machine Company, of Joliet, is of great interest to steam users. Briefly stated, the facts of the case are these: The Bates Machine Company was manufacturing a feed-water heater after the design of T. J. Cookson protected by Letters Patent No. 542,331; the Excelsior Heater Company, on the other hand, used in the construction of its heater the design of C. E. Ferreira, covered by Patent No. 490,319.

The infringement was alleged by the Excelsior Heater Company under three claims of its patent which specified a combination of a steam chamber with a steam inlet, a water chamber with a water inlet, and a settling chamber with connections thereto. The infringement was alleged to consist not only of copying the arrangement of these chambers in the construction but also of utilizing the steam chamber as an oil separator and providing means for carrying the oil away, notwithstanding the fact that no mention was made of such a function in the Ferreira patent and nothing more than a small pet cock in

a steam inlet pipe outside of the heater, that could by the most adroit reasoning be regarded as oil outlet, was shown in any drawing on which the patent was founded.

In the lower court Judge Grosscup held that the Cookson heater was an infringement because of the similarity of the arrangement of the three chambers to those described in the Ferreira patent, which he upheld on the ground that the steam inlet chamber was larger than those of previous inventions and because the heater had gone into more general use.

The Court of Appeals reversed the decision and the opinion, delivered by Judge Woods, ridiculed the pretensions of the Excelsior Heater Company regarding its steam chamber, declaring the evidence showed that the alleged oil separating function was not even thought of when the patent was obtained; further, that the enlargement of the steam chamber and its combination or connection with the water chamber was, in fact, not a novelty at all but a copy of prior inventions. There are a number



THE COOKSON HEATER, MADE BY THE BATES MACHINE COMPANY, JOLIET, ILL.

of other improvements in the heater manufactured by the Bates Machine Company that were not touched upon at the hearing.

The Cookson heater is one that has exceptional advantages from every standpoint. The steam on entering the middle chamber is at once relieved of oil in it, and then it passes around either side of the oil separating plate and into another expansion chamber where another plate separates the moisture from the steam, which then discharges to the atmosphere or to heating system. Water is admitted at the top of the heater and discharges into a spray box, from which it falls through the steam and is thoroughly heated. The supply of



water is automatically regulated by a float which opens and closes the inlet valve. The heater is so designed and constructed that it is exceedingly durable, can be readily cleaned in an hour, can be taken to pieces with a monkey wrench without breaking the exhaust inlet or outlet connections and gives a temperature of 206 to 212 degrees without back pressure. The sectional view indicates very clearly the arrangement and detail of construction of the heater.

### DETROIT BOGUS TICKET CASE.

Recently it was discovered that counterfeit street car tickets were being turned in to the Citizens' Street Railway Company, of Detroit. Conductors W. O. Martin and Alexander Dow and John Cochrane, a motorman, were prosecuted for handling the tickets and Martin was convicted. It was developed that 36,000 of these tickets were printed in Chicago. Superintendent Grant and a detective came to this city and ferreted out the engraver and printer of the tickets. Rudolph Lenert, a journeyman engraver, and J. M. Moore, a printer, were arrested. They claimed that the work was done on an order signed by the company and brought by a negro from Detroit, but were not able to produce the order. This is a very important case, and it seems that the company has taken such energetic steps in the prosecution that all the guilty parties will be brought to justice.

### BARRET JACKS INFRINGED.

The Duff Manufacturing Company, of Allegheny, Pa., manufacturer of the Barret patent jacks has been obliged to resort to legal proceedings to prevent infringements. The circuit court of the United States for the western district of Michigan, Judge Severens, has granted a preliminary injunction restraining the Kalamazoo Velocipede & Car Company from making and selling the Barret patent jacks, as made by the Duff Manufacturing Company.

### REORGANIZATION AND CONSOLIDATION IN NEW ORLEANS.

On October 1 were made public the plans of the various parties in interest providing for the winding up of the New Orleans Traction Company, and the consolidation of the Crescent City Railroad Company, with the New Orleans City & Lake Railroad Company, this latter name being retained. The New Orleans Traction Company was organized in December, 1892, with a capital stock of \$2,500,000 preferred and \$5,000,000 common, and leased the property of the two roads named which it has since operated. It contracted in return for controlling interests in the stock and bonds of the two companies to furnish the roads with electrical equipment and with 50-year franchises on the expiration of existing ones.

Many difficulties were encountered in developing the enterprise; the improvements proved more expensive than was anticipated, and the panic of 1893 made it necessary to raise funds at a sacrifice. In the end the company had to borrow \$1,500,000, on its stock in the two leased roads. It was necessary later to suspend the payment of interest and hence the reorganization.

The solvency of the City & Lake and the Crescent City companies was not affected by the troubles of the Traction Company, since the affairs of each corporation were kept entirely separate, the old organization being retained and the earnings being kept in the respective banks of deposit. The interest on the bonds of the two companies has been regularly paid, and the City & Lake bonds have been a favorite investment, because it was well understood that they occupied an impregnable position, no matter what might happen to the Traction Company, since the earnings of that road were largely in excess of its fixed charges. The Crescent City road, having the same bonded debt as the City & Lake, but with 10 miles less of track, had much less earning power, and, therefore, sailed much closer to the wind. On the other hand, the Crescent City traversed the newer portions of the town, and was believed to have much more margin of expansion;

but recent events have been distinctly unfavorable to a fair test of that kind.

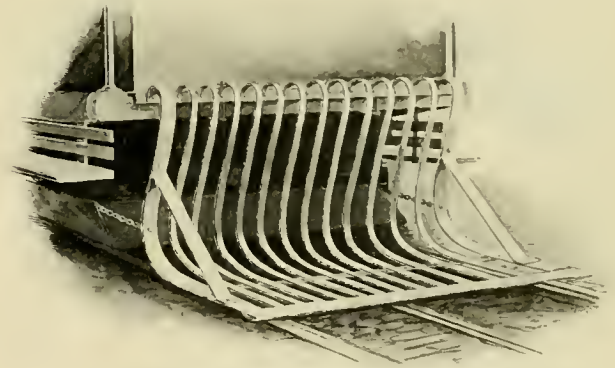
It is the purpose of the reorganization to make one corporation of the whole business and thus secure much greater economy of operation. Under this plan the bonds of the City & Lake road will remain untouched as a first lien on the lines of the company. The Crescent City bonds, the interest reduced to 5 per cent per annum for five years, will retain their present liens on the lines of that company, and in addition a second lien on the lines of the City & Lake, which will make them an unquestioned security. The stockholders in the Traction Company will have to stand an assessment of \$6 per share on the preferred, and \$3 per share on the common, for which they will receive preferred stock in the new corporation. The holders of the collateral trust notes of the Traction Company receive 100 per cent in the preferred stock of the new corporation and 50 per cent in common. The minority stockholders of the City & Lake receive 110 per cent in preferred, and 25 per cent in common. The holders of Crescent City stock receive 100 per cent in common stock of the new company.

What loss occurs will fall upon the New York and Louisville owners, principally.

### FENDER FOR NORTH CHICAGO RAILROAD.

An ordinance was passed by the Chicago city council requiring fenders to be placed on all street cars by September 1, but the time was inadequate for this work and an extension was agreed upon. General Manager Roach, of the North Chicago Street Railroad Company, concluded that a home-made fender would serve the purpose very well. V. T. Lynch designed the fender illustrated, which has been adopted as standard for the cable cars.

The two S-shaped pieces at the sides are of  $\frac{1}{4}$  by 3-in. spring steel. Across the top is a 2-in. angle iron and the bottom is connected by a strip  $\frac{3}{8}$  by 2 in. Between the two side pieces are 23 spring steel strips  $\frac{1}{2}$  by 1 in., which are bent in an S shape on the same form as the side pieces, and cold riveted to the frame. The



FENDER FOR NORTH CHICAGO STREET RAILROAD.

two side pieces are braced as shown. Two brackets  $\frac{3}{4}$  by 2 in. are bolted underneath the platform and extend in front of the buffer. Two holes in the angle iron correspond to the position of the brackets, from which the fender is hung. One chain at each side connects the fender with the truck frame so that it is held at the proper height above the track. The cross bar in front is covered with a 2-in. four-ply rubber hose which acts as a cushion when anything is struck and helps the fender to ride over any small obstructions.

The fender extends in front of the buffer 24 in. and is held about 3 in. above the track. The design of the fender is such that when an obstacle is struck the fender is forced down nearer the track, so that it would be exceedingly difficult for it to pass over any living thing. About 90 grip cars have been equipped with these fenders, all of which have been made in the repair shops of the company.

## TIE PLATES—BENEFITS AND RESULTS TO BE OBTAINED FROM THEIR USE.

From the report of a committee, consisting of W. J. Prindle, J. L. Single, Henry Ware and Edward Marshall, presented before the 16th annual convention of the Roadmasters' Association of America, Denver, Col., September, 1898.

### RECOMMENDATIONS.

First—That tie plates be used always in preference to rail braces for greater safety and higher economy.

Second—That tie plates be used on all ties where the life of the tie is limited by the cutting or sawing action of the rail.

Third—That tie plates be used on all ties whose life is limited on account of the destruction caused by spike killing.

Fourth—That tie plates with soft ties be used in preference to hard ties without any plates, when the natural life of the soft tie is equal to or greater than the natural life of the hard tie, cost being equal.

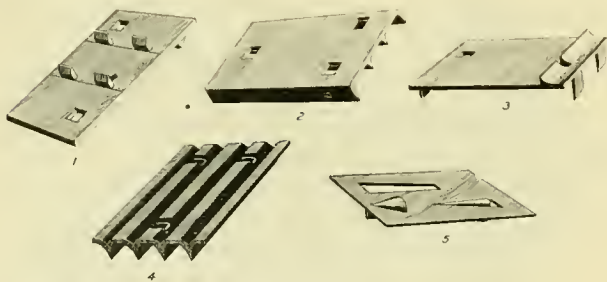
Fifth—That the only plate used be one which becomes practically part of the tie.

Sixth—That as a tie plate is intended to prevent the cutting action of the rail flange across the wood fibres of the tie, the plate used should not itself cut such fibres and should prevent the rail from cutting them.

Seventh—That a tie plate, having sufficient thickness to resist buckling, sand wear and rust, during the natural life of the tie, should be used.

### GENERAL CONSIDERATIONS.

A tie plate is a thin piece of metal, placed beneath the rail and on top of the tie, with the object of preventing the latter being destroyed by the action caused by the movement of the former. It is not a rail chair, but is distinguished from the latter in being thin and light and often having a less bearing surface on the tie than the base of the rail would did it bear on the tie. The first patent on a tie plate proper was obtained in 1871. This was circular and had three teeth below it, but it did not come into extensive use. Several other patents were issued



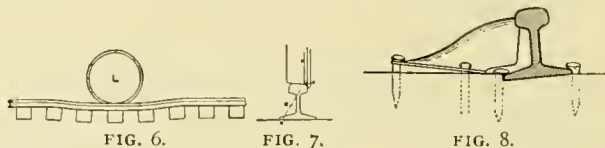
TYPES OF TIE PLATES.

from time to time, but none of them, so far as we are aware, was ever put into practical use. The first Servis tie plate was invented in the '80's and shortly afterwards put into use on a small scale. This was abandoned for an improved one, and this latter was soon put into use on the Manhattan Elevated Railroad, in New York, where such a device was badly needed to preserve the expensive ties in use and to economize the difficult tie renewals. Later came the C. A. C. plate. (See Fig. 1); then the Goldie two-flanged plate, and shortly afterwards the Servis four-flanged (see Fig. 2) and shoulder plate was put on the market; then the Goldie claw plate (Fig. 3) and later the Wolhaupter arch and girder tie plate (see Fig. 4) and the Fox tie plate were put into commercial use. (See Fig. 5.) Many patents have been secured on tie plates, but the aforementioned ones are those which have been in use extensively, or are now in practical use.

### FORCES OR LOADS APPLIED TO PLATES.

First.—As a wheel rolls over a rail each tie is loaded consecutively, and the ballast compressed. The rail bends and takes an undulatory, wavy motion, or lever motion; the portion ahead and

behind the wheel being higher than at the wheel. When the loads are heavy and the rails light, and ballast poor, the action is excessive. Fig. 6 shows this condition magnified. When the wheel is between two ties having plates on them one edge of each plate is loaded. This has a tendency of raising or loosening the other edge of the plate, and at the same time causing



the tie to churn—the wider the plate the greater this tendency is—and it is, therefore, apparent that a narrow plate is the best to resist these forces. This rising and falling of a light rail on a plate allows also small particles of sand to enter between the rail and the plate, which thus becomes an abradant, producing an injurious action on both rail and plate, if continued for any long period, and it would, therefore, appear that particularly where the rails are light some means should be provided for the excluding of this sand.

Second.—Another loading comes directly from the rail and is of a compound nature, which is the chief source of tie destruction. This load is illustrated in Fig. 7, which shows a wheel, rail and plate. The wheel flange is bearing sideways against the rail head, caused by the centrifugal force when it passes around a curve, or from the sway of the train. This force is shown by arrow marked A. The tread of the wheel is also bearing vertically down upon the head, shown by arrow marked B, and these two forces applied to the head of the rail produce a resultant force, shown by arrow marked C, through the rail which strikes the plate at a point marked D, near the outer edge of the rail flange. At D it is resolved into its two components again, with the result that there is a lateral force equal to A tending to slide the rail on the plate and widen gage, and with the vertical force B tending to press the plate into the tie and crush the fibres. This vertical force B will be found to be always greater than the lateral force A. This can easily be determined by taking the common rule for obtaining the centrifugal force: Assuming the known extreme weight of a car or engine wheel and the velocity with which this wheel passes around a curve of small radius, even in a case where the speed is high and the radius short, the vertical force will be four times the lateral.

Considering now the relative merits of a tie plate and a rail brace to withstand these forces on a curve, it will be seen that in the case of the rail brace the small lateral force against the head is resisted by the upper portion of the rail brace and is taken care of by it, but as the vertical force is applied near the edge of the outer flange of the rail, this flange soon cuts into the wood and abrades it and allows the outer flange to become lower than the inner one and carries down with it the upper edge of the rail brace, tilting up the outer end; all as shown in Fig. 8.

Considering now a properly designed tie plate in place of a rail brace, we find that the great vertical force applied near the edge of the outer flange of the rail is taken care of by the plate and distributed over the tie beneath the plate and prevents the outer flange from cutting into the tie and canting the rail; but it is clear that to properly distribute this loading from the edge of the outer flange there should be more metal in the plate beyond the outer flange than beyond the inner one. The small lateral force causes the rail to slide outwardly on the plate, but this is prevented by the spike or shoulder outside of the rail, and as the plate ties the inside spike to the outer one the inside spike therefore also resists this tendency of the rail to widen gage; consequently, if there are as many spikes through the tie plate as there would be through the rail brace the tie plate will prevent this lateral motion of the rail just as thoroughly as the rail brace would; but, as shown above, it also prevents the rail canting, which the rail brace cannot do. It is, therefore, very clear that a tie plate is much better than a



rail brace, and a tie plate with more metal beyond the outer flange than beyond the inner one, is better than one which is equal at both ends. It is evident, of course, that the more metal, or shoulder, there is placed on top of the plate outside the outer flange of the rail the longer such metal will resist the wear from the lateral force, and as a continuous flange from edge to edge of the plate will give the most metal, such a flange would appear to be the most desirable, other things being equal, than a single spike, or even two spikes, particularly where the lateral force is extreme. However, there are many millions of plate in use, doing excellent service, without any shoulder, and there are difficulties, also, in shimming such shoulder plates in winter.

The above excellent features of a tie plate on a curve also exist on tangents, but to a smaller degree. On tangents there is not only the great vertical force from the wheel, but there is more or less lateral force produced by the swaying of the train, trucks skewed out of level, etc., so that the tendency of all rails on tangents is to take an outward cant as well as on curves. This outward cant means widening of gage. This again means increased sway of the train, which again reacts upon the rail. If rail braces are used the tie must be constantly adzed to bring the rail to the perpendicular, the rail brace must be removed and again re-spiked, thus spike killing the tie, and all necessitating the spending of a great deal of time and labor.

#### REPORTS FROM PRACTICAL EXPERIENCE.

In order to obtain, as far as possible, reports of the comparative merits of the different tie plates used side by side in track, as well as the general experience with the use of any one kind of tie plate, a circular letter was sent out to a large number of roadmasters and supervisors of our important railroads in different portions of the country asking answers to a number of questions as to the cost and value of tie plates, which is the best type, etc.

From the replies to the committee (which are given in full in the report), it appears that the cost is variously put at  $\frac{3}{8}$  to 9-16 cent per plate,  $1\frac{1}{4}$  to 2 cents per plate, 1 cent per plate,  $\frac{1}{2}$  to 1 cent per plate, 2 cents per tie, 4 cents per tie.

They are said to increase the life of yellow pine ties from two to three years, and cedar and chestnut from three to five years. One superintendent states that the life of ties on curves has been nearly doubled. Another states the life of ties on curves is greatly lengthened, but that none will lengthen the life of a white oak tie on a tangent. The plates with longitudinal flanges are thought by some to lengthen the life of the ties more than those with cross flanges; others fail to note a difference. There is a large saving in track labor.

The gage is maintained easier and better when tie plates are used, and we can maintain much firmer bearings between rails and ties than would be possible without the use of tie plates. Tie plates practically eliminate the labor of re-gaging or adzing to turn rail. Where sand is used freely the particular damage is due to softening of the wood, caused by the moisture held by the sand around the ties at the rails. In order to get the full benefit of the plate at such places it is important that the sand be kept below the base of the rail and the top of the tie be kept dry.

It might be well to state in general the benefits to be obtained from the use of tie plates.

First.—They prevent the tie from being cut by the rail and thus preserve the tie.

- a. Renewals in ties are reduced.
- b. Level of track is maintained.
- c. Adzing to maintain rail vertical is avoided.
- d. Cost of track labor is reduced.

Second.—The rail is held vertically, and thus—

- a. Safety of operation is increased.
- b. Gage is maintained.

Third.—The inside spikes help to maintain gage in addition to the outside spikes.

- a. They dispense with rail braces.
- b. Prevent the rail rolling.
- c. Maintain gage by preventing the rail rolling.

A number of ties with tie plates in them were submitted with the report.

To obtain, as far as possible, satisfactory information relative to the manner of placing plates, and the cost, together with the number sold, this committee addressed a letter to the various manufacturers of tie plates, with inquiries as follows:

First.—Total number of plates you have sold to, say July 1, 1898.

Second.—Total number of plates sold during the past year.

Third.—Will you kindly say the manner in which you recommend that your plates be applied?

Fourth.—What the cost of applying plates is, from your own experience in placing them by your recommended manner, in both hard and soft ties.

To questions No. 1 and 2 the manufacturers declined to answer definitely. To question No. 3 we find that some of the manufacturers send out printed instructions, which are quite lengthy, but which can be obtained by applying for them. These instructions indicate that the different styles of plates should be applied in different manners to obtain the best results. As to the fourth question, the manufacturers reply that their estimate of the cost of applying their plates varies with the plate and style of tie, from substantially nothing for the application to the soft wood tie, up to four-tenths of a cent for a hard wood tie.

From the above facts and our investigation it would appear that the different forms mentioned have their good points, and there is no question but that tie plates have become most important features of track equipment, and will remain so. They are especially valuable on sharp curves, soft wood ties under heavy traffic and on heavy grade, also in tunnels and yards and at platforms, under street crossings, and anywhere ties are liable to remain wet or become soft.

### PECULIAR ACCIDENT AT ST. LOUIS.

About half past five on the morning of September 17 a car of the Lindell Railway Company, of St. Louis, left the track at the corner of Taylor and Cottage



avenues. The car was running at high speed and on leaving the track crossed the street and sidewalk and struck the front of a drug store which was in its path; the momentum of the car forced it half way into the store, wrecking the front and some of the show cases.

The drug store was not opened for business at that hour and no one was inside. There were two passengers on the car, both of whom escaped by jumping; the motorman was caught between the dash and the body of the car but suffered only slight cuts and bruises and was able to extricate himself.

### CHANGES IN LOS ANGELES.

A syndicate comprising C. P. Huntington, H. E. Huntington, I. W. Hellman, Antoine Borel and Christian de Guigne, all of San Francisco, has obtained full control of the Los Angeles Railway Company, the Main & Fifth Streets Railway Company, and the Main Street & Agricultural Park Railroad Company, and a consolidation and reorganization will doubtless follow soon.

The Los Angeles Railway Company has never been on a paying basis, though retaining its financial ability far enough to keep out of a receiver's hands. The road was reorganized in 1895 when it took its present name. There is a bond issue of \$3,000,000 and a floating debt of about \$400,000. The Main Street & Agricultural Park road has a funded debt of about \$125,000.

It is stated that F. W. Wood, the general manager, will continue to have the management of the new system, while H. E. Huntington will represent the new owners in the executive capacity.

## FOREIGN FACTS.

The traffic on the new Waterloo & City Railway, London, has been above expectations, nearly 100,000 being carried during the first week's operation.

The Lancashire Light Railway Company has applied to the Light Railway Commissioners for a permit to construct an electric railway from Liverpool to St. Helens and Prescott.

The first section of the famous Jungfrau electric railway has been completed and opened for traffic. The construction is very slow and difficult and the summit of the mountain will not be reached until 1904.

Liverpool is constructing an experimental trolley to determine if that system is adapted to the needs of the city. The appropriation of \$250,000 has been increased to \$425,000 to allow for a longer line than was at first contemplated.

It is stated that an English company has been formed to construct an electric railway 45 miles long crossing the frontier of Italy and Switzerland over the Great Saint Bernard Mountain from Aosta to Martigny at an estimated cost of \$3,000,000.

The construction work on the Baker Street & Waterloo Railway is being pushed rapidly. This underground railway will be a little over 3 miles long and will make connections with the Central London, Metropolitan District, and the Great Central Railways.

In Leeds the street cars, instead of stopping at every street corner to take on passengers, will have certain prescribed stations where the cars will stop and at no others. In this way a better schedule will be maintained without great inconvenience to the patrons.

The Calcutta Tramways Company has been granted a new franchise for 30 years providing electric traction is adopted, at least five miles of additional track be laid in 1898, and all the plant, rolling stock, etc., be converted for the introduction of electricity.

An electric railway between Stanz and Engelberg, Switzerland, will soon be opened. The line will be 11 miles in length, part of which has a grade of 25 per cent and upon which a rack and pinion system will be used. A water power will supply alternating currents for the system.

The two sections of the electric railways in Halifax, England, have been in operation for eight weeks. The average weekly receipts amount to \$1,500 and the cost, including interest and sinking fund, \$850. This has been so profitable that the municipality has made preparation for extensions.

A contract for the construction of a 30,000-h. p. water power plant at Shawinegan Falls, on the St. Maurice river, has been let to Barry, Ross & McRae, of Niagara Falls, Ontario. This will be the greatest power development in Canada and the current will be transmitted to Three Rivers and other cities in Quebec.

Glasgow is vacillating over the tramway question. Although extensive investigation was made in Europe and America a resolution was lately introduced in the council inviting all those who had gas, oil, air or other motors to submit their motors for trial. One short line is being equipped for testing the trolley system.

Short electric underground railways built by different companies constitute the only form of traction that is acceptable in London. Another company has been formed to construct 5½

miles of such road from Victoria to Cricklewood, with stations at half-mile intervals and connections with the other underground roads which it intersects.

The central power station for the electric railways in Madrid is approaching completion. Although the Spanish have no great liking for things American, yet they evidently recognize the superiority of American machinery. The two 500-h. p. engines are furnished by E. P. Allis, the boilers by Babcock & Wilcox and the electrical apparatus was all built in the United States.

Electric railway construction is progressing with greater rapidly in Berlin than any other European city. The lines building and planned to be completed in the next four years will provide the city with ample transportation facilities. The total number of motor cars required will number 850, most of which will be equipped with storage batteries to operate on tracks where overhead wires are forbidden.

The electric railway system of Dover, one 2 mile line of which was opened last September and the other one mile in length being opened in December, has proved a profitable undertaking. The receipts per car-mile have been 24.78 cents and operating expenses 12.82 cents. On an average .95 k. w. hour was consumed per car-mile. After paying all expenses there was a net profit of \$6,500.

Two new electric railway projects are in progress in South Africa. A franchise is about to be granted for an electric railway in Johannesburg and extending 25 miles east along the reef and the same distance west. A contract involving \$48,000 has been let for the street railway construction in East London, a Johannesburg firm making the successful bid. This will be increased by \$9,000 by a proposed extension.

The steam tramways of Huddersfield, England, have always been operated at a loss and have proved to be a constant loss to the municipality. The tramway manager and the borough electrical engineer have reported favorably for adopting electric traction on three of the lines, constituting 6.64 miles of single track. A loan of \$250,000 will be asked, of which about \$160,000 will be expended on the proposed trolley lines.

A large power station is to be erected at Mainz, Germany, by the South German Railway Company. This company will convert the present street railways from horse to electric traction, and will construct two lines, one from Mainz to Wiesbaden and the other to Kastel and Eltville. One of the city lines is to be operated by storage batteries and the other by the trolley. It is estimated that at least \$400,000 will be spent in the changes.

The second electric line of the Bradford (England) municipal tramways was completed late in August. It is 3½ miles in length and has some steep grades, there being a total rise of 612 ft. and one grade of 7 per cent. On September 19 Barnum & Bailey's circus attracted a large crowd and the cars were heavily loaded. The motor-man of one of the cars descending the hill lost control of his car which jumped the track at the first curve and ran into a stone wall. One passenger was killed and a number seriously injured. It appears from accounts that the wheels were sliding on the rails.

## WASHINGTON LINE BUYS MORE CARS.

The Eckington & Soldiers' Home Railway Company, Washington, D. C., is improving its service to provide for a rapidly increasing business. Orders were placed this month for 88 additional cars, of which 44 will be built by the American Car Company, St. Louis, and 44 by the Laclède Car Company, of that city. The Peckham Company will furnish 30 of the cars with double trucks.



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<b>Van Wagoner &amp; Williams Hardware Co.,</b> Drop Forged Copper Commutator Segments.	<b>Cleveland, O.</b>	<b>Partridge Carbon Co.,</b> Self-Lubricating Motor and Generator Carbons.	<b>Sandusky, O.</b>
<b>J. M. Atkinson &amp; Co.,</b> Flexible Horse Shoe Rail Bonds.	<b>Chicago, Ill.</b>	<b>W. T. C. Macallen Co.,</b> Standard Overhead Insulation.	<b>Boston, Mass.</b>
<b>American Electric Heating Corporation,</b> Electric Car Heaters of Every Design.	<b>Boston, Mass.</b>	<b>Bradford Belting Co.,</b> "Monarch" Insulating Paint.	<b>Cincinnati, O.</b>
<b>American Rail Joint &amp; Manfg. Co.,</b> "Boltless" American Rail Joints.	<b>Cleveland, O.</b>	<b>Sterling Varnish Co.,</b> Sterling Extra Insulating Varnish.	<b>Pittsburg, Pa.</b>

Special Agents: American Electrical Works, Providence, R. I.

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### HALF FARES.

H. M. Littell has been appointed general manager of the Fairmount Park Transportation Company, Philadelphia, and will also have full charge of the pleasure parks of the company.

Martin Brill and John A. Brill are now making their semi-annual inspection of their steam railroad in Nova Scotia known as the Coast Line Railway. Martin Brill is president and John A. Brill vice-president.

The construction of the electric transmission line of the Southern California Power Company is being pushed and on September 28 the wires were up from the power house in the Santa Ana cañon to Redlands.

The Lynchburg (Va.) Electric Railway & Light Company has been granted an extension of its franchise for 40 years by the city providing it entirely reconstruct its roadbed and overhead work, and equip its lines with new cars.

The Westinghouse Electric & Manufacturing Company has just issued two illustrated circulars. Catalog No. 200 is entitled, "Generators and Rotary Transformers for Electrolytic Work," and catalog No. 201, "Polyphase Inductor Generators."

September 27, a man giving his name as Paul Hall was arrested in the act of stealing some 3,000 ft. of insulated wire from the Citizens' Electric Light Company, of Brooklyn. About a month ago the Brooklyn Heights Railroad lost some wire in the same manner.

The motormen, of the Citizens' Street Railway Company, of Waco, Tex., demanded a reduction in working hours from 12 to

nine with the same pay per day. The president declined to grant the reduction as the earnings would not justify such action. A strike was ordered and new men took the places of the strikers.

A compressed air plant is being built at West Twenty-fourth and West streets to supply compressed air to 22 cars to run on several of the cross town lines of the Metropolitan Traction Company, New York. There will be four Babcock & Wilcox boilers, each of 250 h. p. capacity, and one of the engines will be a vertical cross-compound condensing Reynolds-Corliss, made by the E. P. Allis Company. The car trucks are of special design and these, with the car bodies, will be furnished by the J. G. Brill Company. Paper wheels are to be tried under the cars and great care will be taken to have the cars run noiselessly.

During the past nine months the traffic on the lines of the West Chicago Street Railroad Company shows an increase of 2.73 per cent over the corresponding months of last year. With the exception of July, every month of this year a larger business was done than during the same month in 1897. The following table gives the gross receipts for 1898 and 1897:

Months.	1898.	1897.	Increase.
January .....	\$ 296,620.80	\$ 277,936.06	\$18,714.14
February .....	269,459.98	261,592.83	7,867.15
March .....	318,073.67	302,573.21	15,500.46
April .....	319,620.53	309,684.34	9,936.19
May .....	337,443.11	335,429.68	2,013.43
June .....	346,323.16	338,521.33	7,811.83
July .....	349,325.84	351,509.30	*2,183.46
August .....	353,740.87	340,682.56	13,058.31
September .....	355,011.58	349,403.57	5,605.01
Totals .....	\$ 2,945,619.54	\$ 2,867,303.48	\$78,313.06

\*Decrease.

## ECHOES FROM THE TRADE

The Diamond Electric Company, of Chicago, made an assignment, September 29, to D. H. Roblin, for the benefit of its creditors.

Wendell & McDuffie, New England agents for the American Rail Joint & Manufacturing Company, report orders for 36 miles of joints which are to be used on a new Massachusetts road.

Some of the Crouse-Hinds electric headlights have been put on the cars of the Delaware (O.) Electric Street Railway, and both the company and the public are highly pleased with them.

John W. Baker, of the E. T. Burrows Company, Portland, Me., called at the REVIEW office on his western trip. He reports the sales of car curtains and materials made by his company as very good.

The Electrical Exchange, of Chicago, engaged in the business of buying and selling second hand electrical apparatus, has assigned, without preferences, to L. O. Gilman. T. S. Lane was president of the concern.

One of the Chicago supplymen had the following hurled at him by a lady friend:

"Why do rival street car companies resemble a corset?"  
"Because they reduce the fair."

An English engineer recently said in speaking of a certain patent, that "in this country (England) a patent is simply a license to litigate;" which would indicate that the patent system of Great Britain is almost equal to our own.

At this season of the year most of the street railway companies are getting heavier uniforms and, from the orders received from various parts of the country by F. H. Newcomb, the cap manufacturer of Brooklyn, it looks as if the Newcomb caps are standard.

Frank B. Stone, of 1201 Fisher building, Chicago, who is a large dealer in lumber, has just closed a contract for 450,000 railroad cross-ties for a southwestern road. While this is a steam road, Mr. Stone is just as well able to fill an order for electric railway ties as for steam road ties.

The New York office of the Electric Storage Battery Company has closed an order from the Metropolitan Street Railway Company, of New York, for two batteries of 2,500 k. w. each. They are to be placed in the generating station for the regulation of loads and to use during the rush hours.

The Crane Company, of Chicago, has just issued a complete pocket catalog of 423 pages, which shows the entire line of goods made by it. Incorporated in it are tables of screwed and flanged fittings and valves, and a number of pages of information useful to mechanical engineers. A copy will be mailed to anyone interested upon request.

The Electric Railway Equipment Company has just issued a very neat pole catalogue containing illustrations of everything in poles, brackets and trimmings. A copy will be mailed upon application. Their hustling eastern representative, Elmer P. Morris, has deluged his company with pole orders from eastern roads the last two weeks.

The Arbuckle Sugar Refinery, New York, which has some 7,000 h. p. in boilers, was among the list of "smoke nuisances"

reported to the board of health. Investigation showed that the smoke was due to the burning of sugar cane, leaves and wrappings. All the furnaces are fitted with American under-feed stokers and when the fuel was changed to coal all signs of smoke disappeared.

A. M. Kittredge, general manager of the Barney & Smith Car Company, made the REVIEW office a call when in Chicago recently and advised us that his company is furnishing the equipment of the Union Traction Company, of Anderson, Ind., and is filling additional orders from the Detroit, Ypsilanti & Ann Arbor, and the Cripple Creek District roads. All these are double truck interurban cars.

The R. D. Nuttall Company, of Allegheny, Pa., has recently appointed the Electric Tramway Equipment Company, 7 Great Western building, Birmingham, Eng., its representative in the British isles. The arrangement was concluded through Alfred Wiseman, whom many will remember meeting at the Boston convention, he having visited this country in the interest of the Equipment Company.

The H. W. Johns Company is now clear of the electric heating controversy and reports business as being first rate. It has recently taken a number of large orders, among which is one from the Nassau road of Brooklyn for several hundred heaters. Street railway managers appear to appreciate the decisions against the American and the Gold Companies and keep away from the liability of suits for infringement.

George E. Pratt has been obliged to sever his connection with the Jackson & Sharp Car Company owing to the fact that the business of the other two concerns which he is representing, Forsyth Brothers Company and the Ajax Metal Company, demands his entire attention. The Forsyth Brothers Company's business has greatly increased in the east and Mr. Pratt is having very good success in handling its goods.

The Standard Paint Company reports the largest business with street railway companies since the company was organized. During the month of September the sales of insulating tapes were four times as much as for any two months of 1897. With its well known line of commutator and field varnishes, electric compounds, tape and motor cloths the company has as a customer nearly every railway of account in the United States.

Gus. Suckow, general manager of the Vose Spring Company, recently returned from a two weeks trip which was very successful, he having taken lots of orders for the company's special elliptic and rubber and iron cone springs. Among the larger orders recently filled by the Vose Spring Company are one from J. M. Jones & Sons for 100 sets, and one from the Stephenson Company for 50 sets. There are numerous orders for the special elliptic springs.

Eugene Munsell & Co., of New York and Chicago, importers and wholesale dealers in mica, report a very gratifying demand for their India mica. This firm carries a large stock both in New York and in Chicago and consequently is in a position to fill all orders with great promptness. Munsell & Co. were pioneers in the business of preparing mica for the electrical trade, having sold the Edison Company in the 80's when it only needed two armature winders.

In discussing the papers on "Electric Traction" before the Municipal Electrical Association, England, E. Tremlett Carter (of



the "Electrician") stated that he had spent some months in the United States and had an opportunity of examining what had been done in electric traction, and that there were hundreds and thousands of cast-weld joints on American rails which stood the climatic conditions perfectly well, and moreover obviated the necessity of copper bonds.

The American Rail Joint & Manufacturing Company, of Cleveland, has received an order from Mayer & Englund, of Philadelphia, for joints for nearly 30 miles of track. The American joints have been in constant use on many roads in the west, and from reports are making a favorable impression in the eastern states. The American joint dispenses with the constant expense of supplying new nuts and bolts and tightening the joints.

Recent orders for tandem compound engines taken by the Phoenix Iron Works Company, Meadville, Pa., were five engines for the Park Row building, New York City, aggregating 1,000 h. p., all direct connected; Laughlin & Co., Ltd., Pittsburg, two 300-h. p. compound condensing direct connected engines; Standard Oil Company, New York City, two 250-h. p. compound condensing engines, belted. In addition to these orders are entered for quite a number of simple direct connected engines.

The American Improved Rail Joint Company, 1319 to 1322 Madison block, Chicago, has recently received a large order for cast-welding the track of the Toledo Traction Company, and also an additional order from the North Chicago Street Railroad. A. S. Littlefield, the president of the company, is very much gratified at the success with which the company has met, and advises us that the prospects are very good for more orders in the near future.

The Mansfield & Norton Street Railway, near Boston, has ordered some of the new "Duplex" cars like the one exhibited at the convention of the American Street Railway Association in Boston last month, and a great deal of interest is being taken in this new style of car. With this car perfected as it has been, the street railways may not henceforth use the double equipment to as great an extent as formerly, as this car protects its passengers in any and all conditions of weather.

The Christensen Engineering Company issued a finely illustrated catalog on the Christensen air brake system, especially for the Boston convention. The arrangement is very attractive, the cars with the air brake equipment being illustrated on one page and a testimonial from one of the railway officials appearing on the opposite page. The list includes the interurbans running out of Cleveland, the elevated lines in Chicago and Brooklyn, the Niagara Falls roads, the Cripple Creek District Railway, the Milwaukee Electric Railway and many others.

"Helps in Brazing" is the title of a recent publication of the Joseph Dixon Crucible Company, which is a small pamphlet describing the process of brazing by the dipping method or "liquid brazing" as it is technically called. The brazing crucible is described together with instructions for its use. Incidentally it treats of brazing graphite, the application of which to bicycle tubes prevents the adherence of spelter and reduces the cost of labor as the filing otherwise necessary is not required. Instructions are given how to build and set the furnace, time required for brazing, etc.

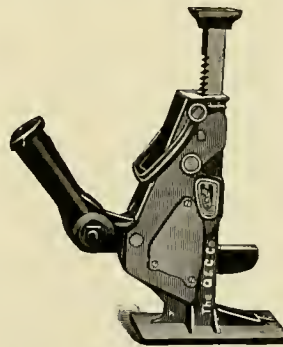
J. G. White & Co., Inc., of 23 Broadway, New York, have received the following letter from the Cataract Construction Company: "You may have noticed in the newspapers accounts of damage done by the tornado, which, on September 26, swept across Grand Island and destroyed a great deal of property in the village of Tonawanda. It will interest you to know that although houses, barns and other dwellings were blown down and several lives lost, the transmission line of the Niagara Falls Power Company, across which the tornado passed, did not lose an insulator, nor was the continuity of the current interrupted for one

# The Q. & C.<sup>co</sup>

## Compound Lever Jacks

**Solid Main Frame.  
Patent Adjustable Levers.  
Quick Trip Action.**

**THEY ARE STRONG  
SAFE  
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PURPOSES.

19...  
DIFFERENT  
SIZES.



Send for Complete List, Sizes, Weights, Capacity, Prices, Etc.

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## Self-Feeding Rail Drill

Will Bore 7-8 in. Hole in Less than One Minute.

BALL  
BEARINGS.

DURABLE  
CONSTRUCTION.



EASY  
ACTION.

LIGHT  
WEIGHT.



VERTICAL  
and LATERAL  
ADJUSTMENT.

USED INSIDE  
or OUTSIDE  
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Furnished with Over or Under Rail Clamps, as desired. Top removed for Passing Cars in Two Seconds. Quickly readjusted for work. Get Our Catalogue and Prices before Placing Your Orders.

# The Q. & C. Company,

700-709  
WESTERN UNION BLDG. CHICAGO, ILL.

second. We believe that you will be gratified to know that the factor of safety upon which you based the construction of this line was well considered, and that the care with which the construction was completed baffles even tornadoes." This line was built by the White-Crosby Company, of Buffalo, of which J. G. White was the senior member, and to the business of which J. G. White & Co. succeeded.

C. F. Orr & Co., 130 La Salle street, Chicago, the largest manufacturers of street railway uniforms in the United States, have issued a very attractive illustrated pamphlet showing some of their standard styles of uniforms and overcoats for conductors and motormen. The great success of this concern has been largely due to a most careful attention to details. Every one of the thousands of uniforms manufactured is made from individual measurement, and no garment is allowed to go out until carefully inspected. The result is a uniform which has the same good fit obtained in custom-made citizen's clothes, greatly enhancing its wearing qualities and satisfactory alike to the wearer, while pleasing to the public.

The Goubert Manufacturing Company, of New York City, maker of the Goubert feed-water heater, states that it is at present exceedingly busy. The magnitude of modern steam plants is well exemplified by the fact that it has just booked the following orders: One 3,000-h. p. heater for one of the New York & Pennsylvania Company's pulp mills. One 3,000-h. p. heater for the Cleveland Railway Company, Cleveland, O. One 5,096-h. p. auxiliary heater for the Metropolitan Street Railway Company, of New York, making 35,000 h. p. now building for that company alone. It has also just delivered 3,000 h. p. to the People's Electric Light Company, of Newark, N. J. These orders, in addition to regular calls for heaters of smaller sizes, among them 1,000 h. p. for the Schenectady Railway Company, and 1,800 h. p. for the Citizens' Light & Power Company, of Houston, Tex., are indicative of the magnitude of the business done by the Goubert Company.

The new construction work on the Eckington & Soldier's Home Railway, Washington, D. C., has been let to E. Saxton, Washington, who will do the city portion, and J. G. White & Co., that in the country. Mayer & Englund, Philadelphia, received the order for International registers and Atkinson bonds. The Johnson Company will furnish the 58 single trucks.

Elmer Morris, New York, will furnish the construction material complete for the electric railway building by the Nyack (N. Y.) Traction Company, of which H. C. Howard, Media, Pa., is the president. He will also supply the material for 18 miles of railway in Doylestown, Pa., and has lately closed a contract with the government for 60 miles of telephone line and equipment.

The J. G. Brill Company is very busy and has orders for cars and trucks from the Southwestern Equipment Company, Philadelphia; from Baltimore, Md.; Hartford, Conn.; Waterbury, Conn.; Newton, Mass.; West Haven, Conn.; Chattanooga, Tenn.; Brockton, Mass.; Olympia, Wash.; Lancaster, Pa.; Portland, Me.; Memphis, Tenn., and also several parlor and passenger cars and over 200 electric motor cars for export.

### T. A. FRAZER SHOOTS HIMSELF.

The many friends of T. A. Frazer, superintendent for the Wells & French Company, Chicago, will regret to learn that he shot himself on October 13, sickness and resulting despondency being the cause. Mr. Frazer was 50 years of age.

The Ottawa (Can.) Electric Railway Company intends to increase its equipment by building, during the winter, a number of open cars for next summer's traffic.

H. C. Higgins, president of the Marinette (Wis.) Gas, Electric Light & Street Railway Company, presented the company of soldiers who went from Marinette with 1,000 street car tickets upon their return.

## WESTINGHOUSE BUYS WALKER COMPANY

The announcement that the Westinghouse Company, with its usual enterprise, had captured the Walker Company, came most unexpectedly. That it was a most brilliant move on the part of Westinghouse is universally conceded, as it not only gives them the magnificent plant of the Walker people, at Cleveland, as a western factory, but brings also over a million dollars' worth of desirable contracts, and the influence of such men as Roswell P. Flower, Anthony N. Brady, Perry Belmont, and others equally strong financially and politically. The Walker plant is one of the finest in the country and the location such as to command both eastern and southern shipments; while for western business it is literally "in it." Cleveland is one of the best manufacturing centers in the country, with the great iron supplies by water from the north, and with the coal fields of Ohio and Pennsylvania close at hand.

The purchase secures to the Westinghouse Company over \$1,350,000 in contracts which had been taken by the Walker, including an order to equip 500 cars for the Compagnie Chemin de Fer Electrique of Paris. This order will now be filled with standard Westinghouse motors, and aside from the immediate profit in what is probably the largest single order of its kind ever given any company, will serve to demonstrate the Westinghouse apparatus in Europe to an extent which will mean several million dollars more business in the next five years.

President George Westinghouse makes the following announcement: "The election of Roswell P. Flower and Anthony N. Brady as members of the Board of Directors of the Westinghouse Electric & Manufacturing Company to represent the interests of the former stockholders of the Walker Company completes the union of the interests of the Walker Company, of Cleveland, with those of the Westinghouse Electric & Manufacturing Company. The purchase by the Westinghouse Company includes substantially all of the outstanding stock and all but \$850,000 of the \$2,500,000 of the 20-year bonds of the Walker Company, the \$850,000 remaining a first lien upon the property. The recent sale by the Westinghouse Company of \$3,000,000 of debenture certificates has erroneously been connected with this transaction. The entire proceeds of the sale of these debenture certificates were used in retiring the floating and other debt of the company, as previously announced.

"The increase in the total yearly fixed charges of the Westinghouse Company, due to the purchase of the Walker Company, will be but a little more than the sum that the Walker Company has been expending annually in defending patent litigation instituted by other companies. The acquisition of the Walker Company will, by reason of the agreement of March 31, 1896, of the Westinghouse Company, put an end to this patent litigation and very large annual expenditure on both sides. The business of the Walker Company, as a controlled company of the Westinghouse Company, will be entitled to the protection of the patents of the Westinghouse Company, and will in all respects be subject to its agreement with other companies in relation to patents.

"The Westinghouse Company regards the business and good will of the Walker Company as a valuable acquisition, especially as the Walker Company brings with it upward of \$1,250,000 unfilled orders. The Walker Company has at Cleveland modern and extensive works, equipped with machinery capable of manufacturing the largest types of railway apparatus, and with the works of the Westinghouse Company at East Pittsburgh, constitute a manufacturing plant second to none in the country. The capacity and profits of the two companies will be increased by carefully harmonizing the manufacturing and selling operations, and the direct savings thereby effected should exceed the fixed charges incurred by the purchase of the Walker Company. The shipments of both companies, owing to the large orders on hand, have been increasing during the past few months, and exceed \$750,000 for August.

"The total fixed charges of the Westinghouse Company, including those due to the Walker purchase and the dividends on its preferred stock, will be \$42,000 per month."





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### CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

### DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

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The passing of a street railway employes' union is noted on another page. About six months ago the employes of the Citizens' road at Waco, Tex., organized a union, and about six weeks ago demanded a reduction of working hours, with a continuation of the same rate of pay per day, which the business of the company would not justify. A strike followed, in which the company won, and the result was the disbanding of the local union.

The city council of Cleveland, on October 17, passed an ordinance providing for a reduction of the cash fare on the street railways to 4 cents, and for the sale of tickets at the rate of seven for 25 cents. The purpose was to bring the matter before the courts and have the right of the city to prescribe fares judicially determined.

We believe that the last city to attempt to fix a lower fare for street railways was Milwaukee. This ordinance, which provided that six tickets be sold for 25 cents, was held invalid by the federal district court; the opinion of Judge Seaman was published in the REVIEW for July, last, page 437. The council wished to make another attempt to fix a lower fare, but the committee to which the ordinance was referred, recommended that it be laid over until the Cleveland case should be decided.

Shortly after the action of the Cleveland council the two companies affected petitioned the federal circuit court for

an injunction restraining the city from enforcing the ordinance. A preliminary restraining order was granted, but the case has not yet been heard on its merits as we go to press. In view of the facts as to the cost of operation of street railways, and the precedents of the federal courts in refusing to countenance any confiscatory legislation, as set in the Indianapolis 3-cent fare case and the Milwaukee 4-cent fare case, there can scarcely be any doubt as to the outcome.

The case is important because there are probably other cities besides Milwaukee which would hasten to pass similar ordinances, were this one to be sustained.

The subject of the corrosion of water, gas and other pipes laid in the streets occupied by electric railways, otherwise known as electrolysis, is at the present time attracting considerable interest, as evidenced by the articles in contemporary publications. In this issue will be found abstracts of two recent papers on the subject, one read before the British Association by an English engineer, and one by A. B. Herrick, published in the "Engineering Magazine;" also a paper read before the American Society of Municipal Improvement, at Washington, last month, by Harold P. Brown.

There is at the present time pending in the United States court a case involving alleged injury to the pipes of the Peoria (Ill.) Water Works Company, caused by electrolysis. The complaint against the electric railways of Peoria was first brought before the court in April last, but no testimony has yet been taken.

A full and frank discussion of the subject will be of benefit to all parties concerned; the only thing to be feared is that the scientific editors of the Sunday dailies may conclude it is again time for a sensational exposé, and by taking advantage of the ignorance of non-technical readers arouse prejudice. When the evil effects of a poorly bonded return circuit were first demonstrated the daily press sought to have it believed that the general adoption of electric traction meant the certain and speedy destruction of all underground metal work. Recently a Chicago paper published an article on the electrolysis of steel in building foundations, quoting an eminent civil engineer as authority for statements which he promptly repudiated.

Since 1891 there have been numerous instances reported of the electrolysis of buried pipes, the last to go on record being that at Dayton, O., investigated by Mr. Brown. We believe that in no case has the question of damages due to electrolysis been passed upon by the courts. In the latter part of 1895 the Omaha Street Railway was sued for \$250,000, the water company becoming alarmed by reports of certain experts; the water company later decided to place larger mains in the business section of the city, and when the old pipes were uncovered it was found that no electrolytic action had taken place, save at one or two points, and at these it was doubtful whether the street railway was to blame. Following this the suit was dismissed. As before stated, a case is now pending involving alleged electrolysis at Peoria, Ill.

It is agreed that under certain conditions metal pipes buried in the ground will be destroyed by electrolytic action, and further, that the remedies consist in providing a thoroughly bonded track for the railway return, thus reducing

the current flow in the pipes, and in connecting the pipes in the danger area (that is, where the pipes are at a higher electrical potential than the rails) to the power house by good conductors so that the current will not leave the pipes through the soil.

It must not be forgotten that in many cases where metal buried in the soil has been found corroded, the cause was not electrolysis due to electric railway return currents. In the REVIEW for December, 1897, was shown an engraving of a badly corroded piece of pipe uncovered in Chicago before any electric railways were in operation in that section of the city. It is reported that on one branch of the government railroads of India the steel ties lost over 40 per cent of their weight in four years, the corrosion being due to the salts in the soil.

Corrosion of iron buried in moist or salty soils may be expected to be rapid. In some cases rails above ground are quickly corroded, as is the case in the Hawaiian islands, where the climatic conditions are terribly destructive on exposed iron. A resident informed us only a few days since that he had frequently, in his examinations of steam tracks on the islands, been able to cut with an ordinary pocket knife, into the base of rails to the depth of a quarter of an inch. In this case the corrosion is chiefly due to the salt air.

Although the street car facilities in Chicago have not been lacking in any particular, yet during the past month the construction of a new line was commenced. The franchise of the General Electric Railway Company gives a right of way through many important thoroughfares on the south side and into the heart of the city as far as Jackson street. The franchise permits the use of any motive power other than steam and the overhead trolley, and a selection has been made of storage batteries as less expensive than a conduit. General Manager Gilbert, of the Chicago Traction Company (storage battery), is authority for the statement that its 25 miles of track were constructed and equipped at an expense of about \$1,000 per mile in excess of what it would have cost for trolley construction of equal merit.

The storage battery cars have the disadvantage of being heavier than trolley cars of equal size and capacity, time is required in the schedule for changing batteries and there is not such flexibility in operating a system with many branch lines as with the trolley. They have the advantage that each unit is independent and the power station machinery is always operated at an economic load. The current can be generated in a large central station and transmitted to sub-charging stations located at suitable points for changing the batteries.

On the Chicago line the time of changing batteries averages 14 minutes, although it is sometimes done in 45 seconds. With the proper size of battery a car can make a run of 20 to 25 miles. The failures in the past have been chiefly due to the inherent defects in the storage battery itself, although the recent improvements in this line have been considerable. The positive plate, which is the vulnerable part of the battery, with proper care is now expected to last for 25,000 car-miles and the depreciation is stated to be two cents per car-mile.

The recognition which has been given the storage battery as an auxiliary to the station equipment during the

past year is rather remarkable. Within the past four years the storage battery output has increased more than 1,000 per cent. The utility of the battery has long been recognized but its heretofore inherent weakness has been an insuperable obstacle to its adoption for such exacting service as railway station work. The variations in current demand occur not only through the day but the momentary fluctuations put an even more severe strain upon the machinery. The storage batteries have been very effective in relieving the engines of these overloads, both where the batteries are placed in the station or in sub-stations at the ends of the feeder lines; in the latter case they are especially serviceable in regulating the voltage.

If the railway company is renting power a storage battery will invariably prove a great saving. An example of this is the Buffalo Railway Company, which rents 2,000 h. p. of Niagara Falls power. The company's steam plant has a capacity of 7,000 h. p. and was formerly shut down only from 11:30 p. m. to 5 a. m., during which time the current was entirely supplied from Niagara. After the storage battery of 1,200 h. p.-hours capacity was installed the steam plant was shut down from 7 p. m. to 7 a. m., and 18 hours on Sunday, while during the day one 800-k. w. generator is kept running instead of two such machines.

In some stations having storage batteries little attention is given to keeping the station voltage at the proper potential for the storage battery. The battery is installed with the voltage estimated at 500 or 520, and the station attendants keep the machines excited to 550 or 600. This prevents the batteries from sharing the heavy loads with the generators. In other cases the general manager has had the battery installed at the end of the line, estimating the drop at 10 per cent, when in reality it is 100 or more volts. Here the battery is kept nearly discharged most of the time and is of little service in taking the momentary fluctuations. This point should be carefully noted by the electrical engineer, and a series of readings taken to accurately determine the voltage to which the battery most readily responds. Then the station voltage should be regulated accordingly, as the generators will operate with equal economy on a voltage somewhat above or below the figures given on the name plate.

In the car barns which have been built in the last few years it has been the custom to reserve a room for employes, either for reading or amusement. In some instances the company furnishes the reading matter and in others the employes have a club or association. Under such circumstances there is less loafing, idle talk and time for mischief. While many conductors and motormen are not naturally of studious habits, yet it is reasonable to suppose that if good literature is easily accessible they will do more or less reading. One of the suburban lines in Chicago has provided such a reading room with good results. The superintendent experimented to find what class of papers and magazines the employes would read. The principle technical papers were furnished, but it was soon found that the technical papers were neglected, with the exception of the STREET RAILWAY REVIEW. So the other electrical papers were discontinued and some of the weekly illustrated periodicals and monthly literary magazines were substituted, and greater interest was shown.



## ADVERTISING TO BUYERS.

The sagacious advertiser, and the one who makes his advertising investment pay him, is he who displays his advertisement where it will not only reach the buyer but so far as possible reach him at the place and time in which he does his buying.

At a recent meeting of the Chicago Trade Press Association, the largest and most influential organization of its kind in the world, the subject of advertising channels was fully discussed. A comparison was made between the advertising in daily papers and in trade and class journals. Every advertiser in a daily paper must pay for the placing of his ad before hundreds and thousands of readers who are not and in the nature of things can never be possible purchasers. At the same time the man who advertises for a second-hand pile driver and the one who wants rare coins will out of the multitude of readers each reach some few who are interested in coin collections or have machinery of the character mentioned for sale.

But advertising in trade and class journals reaches a very small per cent of readers who are not immediately and directly interested in the wares and appliances offered for sale. The manufacturer of anvils would not place his announcement in a publication devoted to the dry goods trade any more than a builder of street cars would think of advertising in a publication whose exclusive field was drugs and chemicals. The trade and class journal is a strikingly successful illustration of the tendency of the times to specialize. The surgeon, dentist, practitioner of medicine, the aurist, the oculist and a score of other departments, each are known as doctors; but the patient in search of treatment for some specific ailment would, if he can afford the best, seek out the specialist on his particular disease. In these days a specialist is considered a special expert in his particular line by reason of his enlarged opportunities and exhaustive study of his branch.

The trade journal is a specialist in the field it represents. It deals exclusively with the business to which it is devoted; it reaches the buyer in his office where orders are given; and it reaches him at the time when he places that order. Hence practically every copy goes directly to the persons the advertiser desires to reach, and when this field is fully covered ten thousand additional copies to non-buyers would be of very little practical value.

The "Fourth Estate," a leading publication devoted to newspaper makers—for editors and publishers have to have their own papers just the same as other people—in a recent issue comments on the value and directness of trade journal advertising, as follows, and the opinion of this high authority should be read by every business man. It says:

"Consider the advantage of reaching the man you want when he is particularly disposed in your favor, properly remarks the Bill Board. Nothing is as bad as approaching a man at the wrong time.

"When a man is reading his trade journal he is interested in his business. His mind is turned toward you. When he finds your ad between the pages of the trade journal it fits in with his thoughts about his business. If you sell anything he can use, this is the time to talk to him about it.

"He will meet you half way. Everything he has been reading in his trade journal has been leading him up to this point. In no other way will your ad. be so sure to strike him at just the right time.

"You can know what he is thinking about when he is reading his trade journal. You can know that he is thinking about something that will make him more or less pre-disposed toward what you have to say. This is the best time to strike.

"If your advertisement were anywhere else than in the trade journal, he would not see it at this time and you would lose part of the interest that the journal has prepared for you.

"Trade journal space is naturally valuable space. It only needs proper treatment to yield proper returns. It is read only by men who are interested in what you have to sell. These men will see your ad at a time when they are thinking about their business. If there is any use in their business for your business, you have the golden opportunity—it is for you to seize it."

## THE SUPERSESSION OF THE TROLLEY.

(From the Electrical Review, London.)

A mild thrill of surprise may have been felt by readers of the "Westminster Gazette" last week when they read the declaration of the doom of the trolley from no less an authority than Dr. Silvanus Thompson. It was not the only paper in which the Doctor enacted the rôle of the prophet, for we recollect seeing a similar statement in one of the great Lancashire papers. The hostile attitude of the trolley and all its works is shown in the last lines of the letter published in our London contemporary. Says Dr. Thompson: "If in Monaco electric cars can be run without overhead wires, and without a slot in the roadway, or a conduit under the slot, it is certain that they can be run in England also. In fact, a short line on private grounds is running in the north of London. London has done well to wait for something better than the overhead trolley wire. But the slot conduit is not the alternative nor the best alternative." The question that naturally arises is, what is the best alternative? The answer is given clearly and emphatically in the "Pall Mall Gazette" of the 13th inst., wherein is described with much garniture the Thompson-Walker surface contact system, which shows that there was more in Dr. Thompson's letter than appeared on the surface. We are not going to waste any time by traversing the non-technical statements of our contemporary, it is obviously in the hands of its writer, who has apparently considered the subject of tramway traction with the open mind that proceeds from a limited knowledge.

Nor do we wish to condemn off-hand the system invented by Dr. Thompson and Mr. Miles Walker. We believe it has—and Dr. Thompson will forgive us for saying so—some ingenious features. So also had Lineff's, the Claret-Veuillier, Kent & Pringles', the Westinghouse, and the host of others which were expressly invented to supersede the trolley. There is no branch of electric propulsion that presents more allurements to the inventor than the surface contact system, and scarcely no subject has called for a larger number of patents. They lie, for the most part, decently interred in the recess of the Patent Office, albeit occasionally disturbed by some eager inventor, anxious to know if he has been anticipated. For all we know, the field in the north of London may be the cradle of the future universal system of electric traction, and Prof. Thompson may, by the aid of his invention, sweep away the "hideous erections" of today.

But when he declares through the medium of the newspapers that the trolley is doomed, he ought to tell the public why he thinks so, considering that of 204 companies in Europe, 173 employ the overhead system, and only eight are worked from underground. It is no new experience for an inventor to take an exalted view of the product of his brain, and we see no reason to acquit Dr. Thompson of taking an exaggerated measure of his invention. When the system, which is being tried in a field at Wilesden, has convinced experts of its utility under practical every day conditions, there will be a boundless field for it to exploit.

It has been an uphill struggle to convince the public authorities of this country that the overhead wire system is neither so dangerous nor so unsightly as many have declared it to be, and many have, in spite of conduits, and notwithstanding surface contact systems, declared themselves in favor of it. Only on Tuesday, at the meeting of the London City Council, the Rev. Fleming Williams spoke of a recent visit to Halifax, where the overhead system was in use, stating that he went there prejudiced against it, but now, from practical experience, approved of it. No one argues that it is perfect, but the method which is going to supersede it has to convince the army of practical men who have been responsible for the 30,000 miles of overhead trolley which exists today. Dr. Thompson's utterances may be useful to such bodies as the County Council, the majority of whose members have a rooted aversion to overhead wires; but though it may help to stave off such systems for London, we do not think we shall be brought any nearer to a surface contact method. The former has proved its utility and its limitations, but the latter has not.

## POSSIBILITIES FOR ELECTRIC TRACTION IN NEW ZEALAND.

BY FRANK X. CROTT.

The introduction of electric traction is now being earnestly agitated by the public and seriously considered by the local authorities in New Zealand.

This colony is one of the most prominent in Australasia that has not done something to benefit the people in the way of pro-



PANORAMA OF WELLINGTON.

viding transportation; there seems to be no insuperable reason for this delay, because the natural advantages of the principal cities are good. They have excellent streets and the climatic conditions, the local coal supply and the adequate population would justify the construction and maintenance of an electric tramway. Such roads have proved profitable in American and Europe under less encouraging circumstances.

The early history of this rich and prosperous colony is generally known, but the character of the people in business is not so well known beyond the field of their commerce. The commercial interests of New Zealand are going to be of great importance, vastly more than the people realize, and the change for the better is coming more quickly than expected. British and American occupation of the South Sea Islands and the far East will hasten this anticipated prosperity. One thing more than anything else that convinces strangers visiting Australasia is the high order of intelligence prevailing among the people there, and

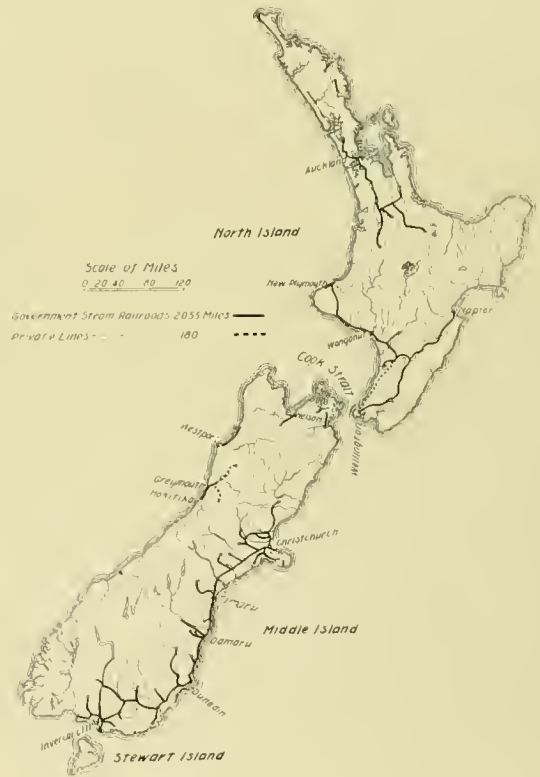


PANORAMA OF DUNEDIN.

the men in charge of the Colonial Governments are of the highest character and probity.

In Dunedin, in the south, the characteristics of the community are Scotch in the majority. The cities of Christchurch and Lyttelton are strictly English. Wellington, the seat of government, and Auckland, the metropolis of the north, are rather cosmopolitan.

The islands of New Zealand, as shown in the map, are about 1,280 miles across the Tasman Sea, east of New South Wales; the fact of this distance is not realized by the world at large. The aggregate population is approaching 800,000. The entire area is about 105,000 square miles—about the size of the United Kingdom. The extreme length is 1,100 miles; the breadth is variable, ranging from 45 miles to 250 miles, the average being about 140 miles. The north and middle islands are separated by Cook Strait, twelve miles across at the narrowest part, which is a great advantage, as it gives facilities for local and foreign communication without the necessity of sailing round the extremity of the colony.



MAP OF NEW ZEALAND.

The physical features of New Zealand, and the location, make the climate varied. The month of July is winter. Christmas is the hottest period of the year. The extremes of temperature are not unlike California, and also some parts of Great Britain. No snow to speak of falls north of Dunedin. The mean annual temperature in winter is 48 degrees and in summer 63 degrees. Auckland, in the north, has a higher mean temperature both winter and summer.

The exports are wool; kauri timber, cut to standard size blocks for paving, as used in London, Paris and other European cities; kauri gum used abroad and especially in Detroit, Mich., for the manufacture of varnish; frozen mutton and beef, sent to England via Cape Horn in refrigerator ships; tallow, Westport coal, etc., the value aggregating annually about \$50,000,000.

The population of Auckland (and suburbs) is estimated at 57,616. Situated on the Waitemata Harbor, it is called the "Queen City of the Pacific," but the "Phoenix of the Pacific" is an appellation more appropriate, owing to its extinct volcanoes, and the disintegrated lava covering the surface.

Auckland has practically two harbors, one each at Onehunga and Auckland. A narrow isthmus seven miles in width, divides these two parts. It is now a part of the municipal project of



Auckland to connect these two harbors with an electric tramway, giving frequent service. The Union Steamship Company, of New Zealand Ltd., has elegant steamers running from Onehunga harbor to New Plymouth, on the west coast, and thence transports passengers by rail to Wellington, making a short cut. The traffic is very large in the aggregate during the year. Round about Auckland are many interesting places to visit, Mount Eden, ostrich farms, parks, athletic grounds, etc. There are many schools and universities, musical societies, free public library, etc. The harbor is completely sheltered and large enough to accommodate the world's navies. The depth of the water at low tide is nine to five fathoms. The rise and fall is from

an electric tramway for a period of 30 years, paying a rental of \$2,000 per annum and also paying the city a share in net annual profits at the rate of 5 per cent up to \$25,000 and 10 per cent on any excess over that sum. The route is specified, but extensions are to be made from time to time, which goes to accentuate the superior advantages of Mr. Bingham's proposals. The city council has exacted from Mr. Bingham a cash deposit of \$5,000 to guarantee the construction of the proposed road within a specified period; otherwise the deposit will be forfeited to the city. It is reasonable to suppose, under the circumstances, that orders for structural material will be arranged for at an early date. William Coleman is Mr. Bingham's solicitor.



Wellesly St.



Panorama of Auckland.



Queen St.



River Front.

VIEWS OF AUCKLAND.

eight to twelve feet. The whole harbor and approaches are lighted by electricity and clearly marked by buoys and beacons, so that at anytime the port may be entered with safety.

The Bank of New Zealand was established in 1861, in Auckland, which continued to be its headquarters till 1890. The management is now at Wellington. The capital of the bank is \$15,000,000. It does the business of the government of New Zealand and transacts, approximately, half the banking business of the colony; it has 126 branches in addition to establishments in London, Australia and Fiji.

The city of Auckland is now preparing for the conversion of the present obsolete horse tramway into an up-to-date system of electric propulsion. The city council has accepted the proposal of W. Gentry Bingham, who is an engineer from England. There was some sharp competition for the concession, but the field narrowed down to Mr. Bingham's offer to construct and operate

There is also a proposition for the immediate construction of an electric tramway in the vicinity of Auckland, from Devonport to Lake Takapuna, and ultimately extending to Northcote. The project has already been approved by the Waitemata council.

Devonport is one of the many interesting places on the shores of the Waitemata, and here many of the business people of Auckland reside. Lake Takapuna is equally attractive, the beaches being perfect and extending for miles. St. Heliers is likewise a most popular holiday resort on the western shore, all of which are absolutely free from treacherous winds, and invariably canopied by bright sunny skies. Race meetings are held at Devonport, the Takapuna Jockey Club being the most successful of the suburban clubs of the colony. On these occasions as many as ten to twelve thousand people attend the races. These incidentals are mentioned to convey an idea of what inducements this city of 58,000, and its suburbs, offer for a first-class



system of electric traction, and it is worth while to consider what rapid transit would do in Auckland and suburbs, and how fast the example would be followed in many other cities in the colony where electric traction is absolutely unknown.

Wellington has a population of about 42,000; it is on the north island and the capital of New Zealand, the midway seaport and the coming London of the colony. Geographically it has the necessary advantages for both local and foreign commerce, as previously described. Wellington is now operating an antiquated horse tramway which is practically owned by the Hon. M. S. Grace, C. M. G., one of the leading citizens of Wellington. Dr. Grace is open in his expressions favoring electric traction, but the local opposition by those who do not understand the many advantages which would accrue from having rapid transit obstructs the way for an improvement, which would otherwise be immediately installed by the present managers of the horse tramway. Very likely J. R. Blair, mayor of Wellington, will no doubt ultimately encourage the introduction of better means of transportation in the city which by its unique position and the energy and intelligence of the people controls the commerce of New Zealand.

The city of Christchurch (and suburbs) has a population of over 51,000; there is much rivalry between this place and Dunedin to

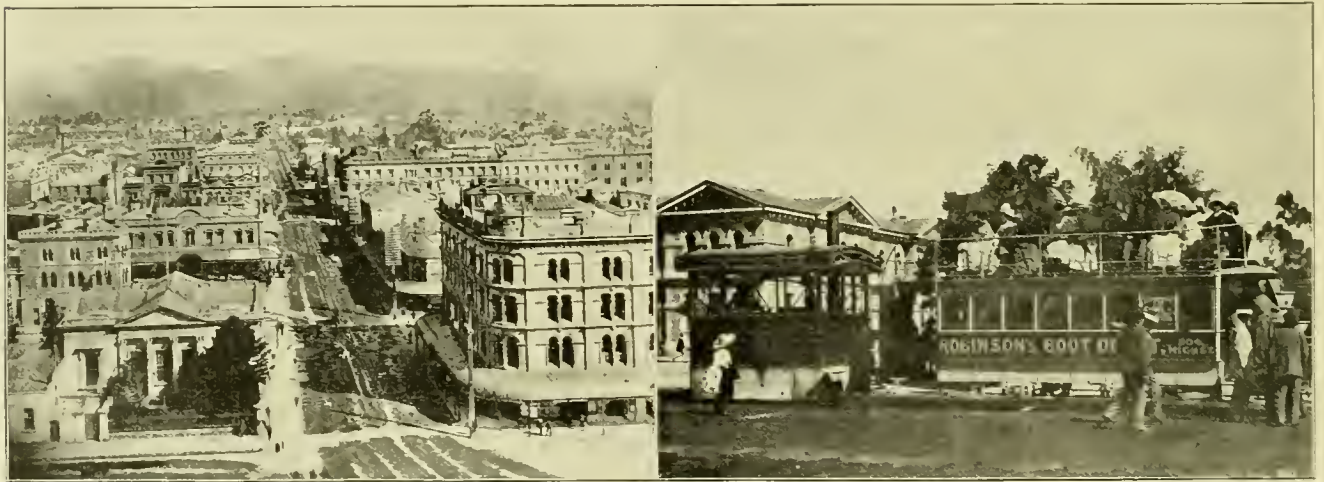
## THE TOLEDO-BOWLING GREEN CONTROVERSY.

The circuit court at Toledo, Ohio, October 22, rendered a decision in case of the Toledo & Maumee Valley Railway Company against the Toledo Traction Company, commenced in the court of common pleas in July, last, and after judgment rendered there, appealed to the circuit court.

The former company operates an electric railway as a belt line, cars running to Maumee on one side of the Maumee river, crossing at Perrysburg and returning to Toledo on the other side of the river; within the city limits of Toledo it runs its cars over the tracks of the Toledo Traction Company, under a contract with that company. The Toledo, Bowling Green & Fremont line extends from Bowling Green to Perrysburg, a distance of 13 miles.

The contract between the Maumee and the Traction Companies was made in 1894 and contains the following clause:

"The parties hereto desire to make a mutual arrangement and agreement whereby said roads may be connected so that the traffic over the road of second party (the plaintiff in this case), may pass over the roads of first parties, so as to make a continuous circuitor belt line connecting the city of Toledo and the vil-



VIEWS OF CHRISTCHURCH

hold the record as the metropolis of the middle island. The former city seems to have the lead at present. Ranald Macdonald is the general manager of the tramways of Christchurch, which are operated both by steam and animal power. Mr. Macdonald has recently visited the United States to inspect the street railways and investigate the advantages of installing electricity in Christchurch.

Lyttleton is the seaport for Christchurch, which is only a short distance. These two places will be connected when the installation of electricity is made.

The city of Dunedin (and suburbs) has a population of 47,280. It is situated in the extreme southeasterly point of the middle island. It is an enterprising place, where many commercial projects are located. There is a fine opportunity for electric tramways to supercede the present systems there. It will, no doubt, be accomplished as soon as the contemplated Auckland tramway shows favorable results.

There are other cities in New Zealand of ample size to justify the construction of electric tramways on the lines of some of the small systems built in America and Europe.

It appears that there are many street railways projected in Paris and there will be great activity in this line before the exposition in 1900. The municipal department has sanctioned plans for 35 new lines, all to be run by mechanical power, between the center of the city and the suburbs.

lages of Maumee and Perrysburg, and so that the traffic may be transported between the points named, without change of cars or delays of any kind."

In November, 1896, the Maumee Company applied for an injunction against the Traction Company to prevent it from interfering with cars. The ground of attempting the obstruction was that the Maumee cars were running through from Bowling Green to Toledo. This case was finally decided in the circuit court in October, 1897, the injunction being sustained.

The court, in the present case, after reciting the fact of the previous suit and its decision, proceeds to discuss the facts of the present case as follows:

"Following the decision in October, in December or January next, the plaintiff company took two of its cars that had been running for a year or more, and by agreement with the Bowling Green Company arranged that the Bowling Green Company should furnish two cars in their place. The Bowling Green Company purchased two new cars for that purpose and put them upon the track, perhaps in January, 1898, and commenced running them, and did run them from that time until this suit was commenced in July. About April of this year the plaintiff company took off two more of its cars, and the Bowling Green Company, having two cars which it was not using, and which had been stored, I think the evidence discloses during this preceding controversy, put these two cars on. So that at the time of the grievances which are complained of in this case, the Bowling Green Company was running four of its cars over its own tracks



and road and over the tracks and road of the plaintiff, and over the tracks and road of the defendants, and carrying such traffic and passengers as it could pick up along these lines. Thereupon the defendants obstructed those cars, and refused to carry them. The defendants claim no right to obstruct any others in this case. The proceeding is to enjoin them from obstructing these cars.

"I have no time to review this case nor to go over these contracts, and do not need to do so. We think, upon a consideration of the case as made, that it is essentially different from the other case. It cannot be that in and of itself this constitutes a very strong element of difference, since it is argued here, and urged upon us for consideration, that no more cars are being run over the defendants' road than were being run at the time of the trial of the other case. That of course cannot be a distinctive element; for this contract was to receive a fair construction. The Traction Company and its colleagues, whichever they may be, have agreed that they would carry the cars and traffic of the Maumee Valley Railway Company over the lines described in the contract, and whether it takes three or six cars to carry that traffic, they will be bound to do it; and it will hardly do to say that because no more cars are run this year than last, that therefore the defendant cannot complain, even if compelled to carry the cars of other railroad companies, with the traffic of other railroad companies. If we were to make that the rule to determine the defendants' liability here, then it would be true that if the Maumee Valley Railroad Company, by reason of the building up of the country above the city, should require instead of three or four cars, or whatever number it has been heretofore running, eight cars, it could not run those cars under this contract. That construction the plaintiff would not agree to, for it is clear, under that contract, that it would not be proper. It is clear that the defendant companies are bound to carry the cars and traffic of this railroad. As I said before, how much more they may be bound to carry is an undetermined question which we have presented to us. We hold then, upon the ground solely that the cars of their own which they were running, and the traffic which they were running of their own, was property and fairly, under the terms of the contract, their traffic and their cars, which the Traction Company was bound to receive and carry; but we do think it makes a vast difference when the claim is made that the Maumee Valley Company may take the car of any other railroad company that it came in connection with, and run those cars over its track and over the track of the defendant companies, under this contract. Somewhere it seems evident that the line must be drawn, and we may as well draw it at this point as at any other. This may not seem a very large matter in and of itself, but the parties have invoked the jurisdiction of the court to determine this question, and we have felt compelled to hold and to decide that in this case, where it is conceded that the cars which it is proposed to run are not the cars of the plaintiff company at all, but are the cars of another railroad company, running from off another railroad company's tracks upon its tracks before reaching defendants' lines, that the defendants are not bound to receive them and that therefore they could be justified in stopping them before they come upon their tracks, or at any point where their tracks connect.

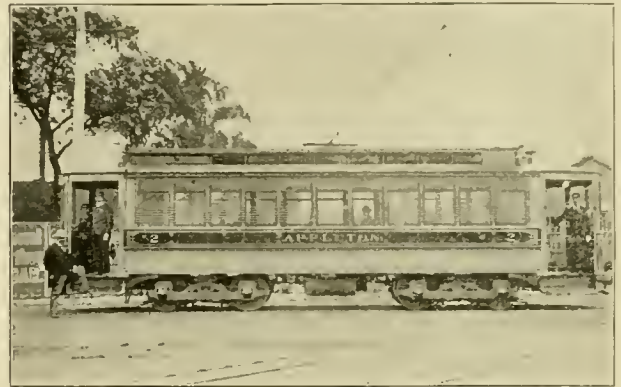
"I think it is evident that questions of this kind of transportation are about to become very important questions, and other lines of railway within the near future will undoubtedly be constructed, either connected with some of these roads involved in this controversy, or coming to the city of Toledo independently of them; and if those companies desire to run their traffic into the city of Toledo, it would seem that they will have to make arrangements with the defendants, if they desire to use their tracks, or else secure a right over them in some other legal way, or an entrance along the streets of the city. We feel fully justified in saying that the plaintiff has not proved here an equitable case for injunction, and therefore the petition will be dismissed."

The Tri-City Railway Company (Moline and Rock Island, Ill., and Davenport, Ia.) on October 17, chose directors, and the board re-elected the officers as follows: President, E. E. Cook; vice-president, F. C. Denkman; treasurer and general manager, James F. Lardner.

PROSPEROUS WISCONSIN INTERURBAN.

Lake Winnebago in Wisconsin is connected with the head of Green Bay by the Fox river some 30 miles long, and this valley and the territory about the lake and bay offers a very promising field for an interurban system of electric railways. The Fox River Valley Electric Railway Company has now in operation nine miles of road connecting the three towns of Neenah, Menasha and Appleton and intends eventually to extend its lines both north and south so as to give a through line from Oshkosh to Green Bay, passing through all the important towns in the valley.

The road has been in operation since the middle of June last, and has proved to be a very popular and successful line. The



FOX RIVER VALLEY LINE—BARNEY & SMITH CAR.

rails are 7 in. Shanghai; spring point split switches are used throughout. The trolley wire is double No. 000 figure 8. The construction work was done by the Deggan & McLean Construction Company, of Cleveland.

The rolling stock equipment consists of four motor and four trolley cars built by the Barney & Smith Car Company, of Dayton, O. The motor cars each have four 35-h. p. motors. The cars are



FOX RIVER VALLEY LINE—BARNEY & SMITH CAR.

equipped with Baker hot-water heaters, Christensen air brakes and Wagenhals electric headlights. There are no fuses on the cars, circuit breakers being used instead and giving the best of satisfaction; in fact Mr. Holcomb, the manager, thinks that they are a great improvement over fuses. Electric headlights are found very desirable because the rural highways are not lighted.

The offices of the company are at Appleton, Wis., and the officers are: President, Henry C. Payne; secretary and treasurer, H. D. Smith; general manager, W. H. Holcomb; electrician, A. K. Ellis.

## THE PENNSYLVANIA STATE CONVENTION.

The seventh annual meeting of the Pennsylvania Street Railway Association was held in the Board of Trade Rooms in Scranton, October 19 and 20. General Manager Silliman, of the Scranton Railway Company, acted as presiding officer in the absence of President Wright. The meeting was called to order at 11 a. m. Wednesday, and the opening address was made by R. J. Beamish, secretary to the mayor of the city.

### ADDRESS OF WELCOME.

I come to you this morning as the speaker extraordinary and envoy plenipotentiary of his honor, Mayor Bailey, who is unable to be present on account of important business engagements. As speaker, my speech will be extraordinary for its brevity and dryness; as envoy plenipotentiary, it will be my duty to treat with you.

In olden times the mayor of a walled city gave to visitors whom he wished to honor the keys of its gates, in order that they might come and go at their own good pleasure without espionage or questioning. It is not necessary for me, on behalf of Mayor Bailey, to give you the keys of the city of Scranton—The Scranton Traction Company has them already. Through every great gateway of this prosperous city runs the poor man's palace car—the trolley car. Not only is it the vehicle of the common and lowly, but it is also the carriage of all classes. I might well compare our trolley system with the great loom of some restless weaver. Its shuttles, charged with life and energy, moving along steel guides, they weave the threads of business and social intercourse, and upon those threads is firmly held and bound the feeling of common mutual interest. This common mutual interest is the sociability of modern civilization. It is this fabric of civilization which the trolley line of today weaves and it is to the inspection of the Scranton sample of the cloth that I now, on behalf of Mayor Bailey, bid you welcome.

I will now leave you to the tender mercies of the master weaver and boss of the local loom, Mr. Silliman.

A letter was read from President Robert E. Wright, saying that it would be impossible for him to attend the meeting.

Vice-president, Frank Silliman, Jr.: At this point we had expected to listen to the annual address of the president. I am not prepared to fill his place in respect to that. This was thrust on me a little too quickly, but I am glad, in behalf of the local loom, to welcome you all to Scranton, and it has been a good many years—in fact I don't know that the state convention has met here before—and I am delighted to see you all here.

The meeting then adjourned until 2 p. m., when the convention was again called to order and the first paper read.

### Parks and Amusements.

By E. H. Davis, General Manager Williamsport Passenger Railway Company.

The street railways of Pennsylvania, before the introduction of electricity as a motive power, as a rule, were very profitable properties, deriving their profit from the facilities afforded the public by the railways alone. It has only been since the introduction of electricity as a motive power that street railway companies have attempted to create travel, in addition to their regular patronage. This, no doubt, has been due to the fact that many street railways, after being equipped electrically, were not as profitable as expected, and it became necessary, or was deemed advisable, to stimulate travel by new methods. In many cases, where electric street railways have been operated at a profit from their general business, they have not gone into the amusement business. But to have a park, and to furnish amusements, to create travel, has become fashionable, and like all luxuries, has in many cases proven expensive. Whether a street railway property that cannot be made profitable without a park, is a desirable property, and whether a park can be made a source of profit from year to year, and thus keep the property alive financially, must be decided by investors in each case.

After all, the question of parks and amusements must be de-

termined by local conditions. In a favored few cases, public parks, or natural resorts, create travel at no extra expense to the street railways. In this event, or where private capital maintains a park, it is neither necessary nor advisable for a street railway to have its own park. Boston has but one park maintained by a street railway, and New York practically none.

Where no natural resorts exist, it has become quite customary for street railways to make parks and furnish amusements for the creation of travel.

A danger to be avoided is the expenditure of too much money to make the park attractive, as the travel created by a new park is very large while the novelty lasts, and when curiosity is satisfied, falls off very materially, more than one-half.

As regards the management of the park itself, when it is large, well laid out, attractive, and well equipped with the minor amusement features, the policy should be to permit entrance to the park free only to patrons of the road, charging others a small admission. The public should be educated to the fact that the railway park is not a public institution, but a business undertaking, and to be operated at a satisfactory profit, or not at all.

It has been the experience in many cases, that the ordinary travel is not sufficient to pay for the proper maintenance of a park, and it therefore becomes necessary to hold and increase the travel created by the park itself, by the furnishing of amusements.

The amusements generally furnished, now require the manager of the street railway to add to his few other duties that of a theatrical booking agent, and as bands and musical organizations in most cases will not prove profitable for a season, recourse has generally been had to theatrical entertainment changing weekly.

It has been said of parks in Pennsylvania, that they are not operated upon the most profitable basis; that all entertainments should be free, and that the increased travel and receipts from park privileges would result in a greater profit than if an admission fee be charged to the attraction. However that may be, until satisfactory attractions can be secured at more reasonable prices than has been the case up to the present time, the experiment is not likely to be generally tried.

The character of the amusements furnished must depend largely upon the tastes of the patrons of the street railway. In some cases, a good opera company has been maintained throughout the entire season, with success. In others, and the majority, cheaper vaudeville companies, changed weekly, have also been profitable.

It has been endeavored to cheapen the cost by using the same attractions in a number of parks, but owing to the variety of public tastes, it has been found difficult to make such plan successful.

The custom has become general to charge a small admission fee to these amusements, and it is the intention and hope of each railway manager that such admission shall at least pay the cost of the amusements, but I doubt if such has been the general rule. In attempting to accomplish the desirable results, two classes of amusements have been tried, one costing not over \$250 a week, changing weekly, and another, of a much higher grade, costing \$350 a week and over, and running a season, or a number of weeks. Taking into consideration the loss due to bad weather, and other attractions in the town or city, the first class is more likely to prove satisfactory.

The varied experiences of park managers, and the difference of opinions as to the best kind of amusements, afford some basis for the statement that parks and amusements do not secure an adequate return for the time and money expended by street railways, and that in smaller towns and cities with limited patronage, investments in parks and amusements should be made only after the most careful consideration, and the benefit of the doubt given against rather than in favor of such investment.

In the discussion, A. F. Walter, of the Allentown & Lehigh Valley Traction Company, said that his company maintained a park, but from a financial standpoint it did not pay, and the company would be glad to be rid of it. First, theatrical entertainments were given, at a cost of \$250 to \$350 a week, then an









selves, and should take away the ten dollars used for change. The amount left belongs to the company, and if they have been careful and correct in registering all fares, making change and reading registers, it will exactly agree with the amount required by their daily reports. If the company has receiving clerks, the cash should be given to them; if not, it should be deposited in a receiving safe, which should, of course, be of such construction that when money is deposited in it, it cannot be taken out except by means of the combination lock. Daily reports should not be enclosed with cash, but should be deposited separately. For depositing cash, conductors should be supplied with canvas bags, in which, with the money, there should be enclosed statements of cash on cash slip forms furnished by the company, the same to be signed by the conductor. If the money amounts to more than their reports call for, the overage properly belongs to the company, the conductor having first been allowed to take away what belonged to him. All the money, then, should be deposited and a statement made on the cash slip that there is a certain amount more than the daily report calls for.

If all fares have been recorded the difference might be accounted for by the conductor having made change incorrectly, giving some passenger less than he should, in which case the money should be in the possession of the company to return to the passenger against whom the mistake was made, should a claim be made with good proof of such an error. If too few fares have been registered, then surely the overage belongs to the company. At any rate, after the conductor has taken out his own money, considering him to be honest, he will give to the company what is left.

On the other hand, the conductor may give a passenger too much change, or may make an error by registering too many fares, or passengers may register fares, as often happens, on account of which, in either case, the conductor would have a shortage of money, compared with the amount required by his daily report of registers. In case of shortage of cash in making reports, conductors should either take from their own money enough to balance with the amount required by the registers, or should deposit the amount left after taking out their own money, making a statement to the cashier that, according to their calculations, the registers require a certain amount of money more than deposited.

The first duty of the cashier of the company each morning should be to take the cash from the safe, and in counting the money of each deposit, see whether or not the amount enclosed agrees with the statement, making a note of an overage or shortage. After thus checking the cash from each conductor, he proves his own work by adding the amounts of all the statements, thus getting a total result, which should balance with all the cash, considering, of course, the item of shortage and overage.

While the cashier is counting the money and checking the cash statements, the run clerk should be checking the conductors' daily reports of registers, carefully auditing each report. The run clerk should begin by comparing the state of the registers as left by the conductors on the previous day, with a report of their readings as taken by the car starter or dispatcher (see Form 3), who should be required to report to the run clerk every morning the readings of the registers of all cars as the conductors leave them when going off duty, and before they take them from the car-house when going on duty, his statement being compared with the conductors' reports of the readings of registers when taking the cars out for service; and if inspectors at the repair shops find it necessary to disturb the state of registers for the purpose of repairing them, a full report from the repair shops should be made to the run clerk, stating the readings of registers before and after repairing, also stating when registers out of order have been substituted in cars by those in repair. In this way there are at least three checks upon the state of the registers from the time the cars go off duty until they are taken out again. Starting in this manner, the run clerk continues to check from one conductor's report to another each register used by each conductor from the time of leaving the car house until the car returns, being careful to note whether

#### A. F. Walter.

A. F. Walter was born in Preston county, West Virginia, December 26, 1866, and was reared and educated in the same locality. At the age of 21 he went to Cleveland, O., and became connected with the Brooklyn Street Railroad Company in the capacity of stenographer, and in 1891 he was appointed cashier of the company. In 1893 he accepted a similar position with the Allentown & Lehigh Valley Traction Company. At the annual meeting of the company in 1895 he was chosen secretary and treasurer, which offices he still fills. In addition to these duties, Mr. Walter has been general manager of the system of roads of this company for the past two years. He has been with the Johnsons since the beginning of his street railway experience, as Hon. Tom L. Johnson was president of the Brooklyn Street Railroad Company and Albert L. Johnson is president of the Allentown & Lehigh Valley Traction Company.

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or not the readings of registers are the same on the conductors' reports leaving cars as on those taking them.

The dispatcher should not allow conductors to examine his reports, but he should be instructed to make his reports promptly to the main office for the run clerk.

In checking up the conductors' daily reports, the run clerk may find an error in comparing one with another, which may explain the cause of shortage or overage in their accounts. If there is a shortage which cannot be explained by the checkings of the cashier and run clerk, the conductor should be required to pay it. If the shortage is of any considerable amount, compared with the money reported, the character and ability of the conductor should be taken into consideration and a thorough investigation made before deciding positively that he should pay it, giving him the benefit of all reasonable doubts that exist. We believe, however, that it is good practice to return to conductors whatever cash is paid into the office by them more than their reports call for and to require them to pay all shortages.

A very convenient manner for collecting shortages and returning overages, is to furnish the cashier with a book of blank statements attached to stubs, which are duplicates, something on check book form, requiring the cashier to send statements to all conductors each day in whose reports there are errors, keeping duplicates in the office. If a conductor's money is short of the amount required, he should return the statement with his cash the following day, enclosing the amount of the shortage. If he has deposited more money than called for by his registers, he should then also return the statement with his cash the following day, receipted, keeping from the money of this deposit the amount of overage stated.

The run book (see form 4) should show as nearly a complete record of each day's business as possible to arrange in a condensed form. Each conductor's name and number should be entered, with a record of all the cars used, the number of trips made, the miles of each trip, and the total mileage of all trips, the number of cash fares, transfer and complimentary tickets collected, number of passengers carried, amount of money reported by each conductor and the total amount reported by all conductors, each division appearing separately, and finally stating the results from the operation of the entire system in convenient statistical form.

The register record (see Form 5) is the companion to the run book, and in it the numbers of all the company's cars should be printed, grouping the numbers of closed and open cars separately. Opposite the car numbers should be ruled spaces in which to enter the reading of the registers of all cars before and after their daily service. Of any one car, by taking from the register reading at the close of the day what it was when entering service, the result is the number of fares registered during the day. This should be compared with the reports of all the conductors using that car, and if the registers have been correctly read, the total number of fares reported by them will equal this difference.

The run book shows the number of fares registered by each individual conductor and the total of all conductors on duty each day. The register record shows the number of fares registered

on each car and the total on all cars in service each day. The total fares registered as shown by the run book will agree with the total shown by the register record.

The run clerk should write at the bottom of the pages of the run book and register record on which the entries are made, the amount of the gross receipts for the day, and the cashier, after carefully auditing all the entries, finally brings the work to a close by signing his name to the amount written by the run clerk, thus certifying to its correctness.

The following officers were elected for the ensuing year:

President, Frank Silliman, Jr., of the Scranton Railway Company, Scranton, Pa.

First Vice-President, Wm. B. Given of the Pennsylvania Traction Company, Lancaster, Pa.

Second Vice-President, Dallas Sanders, of the Schuylkill Traction Company, Girardville, Pa.

Secretary, S. P. Light of the Lebanon & Annville Street Railway Company, Lebanon, Pa.

Treasurer, W. H. Lanius, of the York Street Railway Company, York, Pa.

Executive Committee: Frank Silliman, Jr., Scranton; S. P. Light, Lebanon; W. H. Lanius, York; E. C. Felton, Harrisburg; C. P. King, Pottsville.

On invitation of W. V. Given, of Lancaster, it was decided to hold the next convention in that city.

On Wednesday night the delegates of the association and visitors were entertained at a banquet given by the Scranton Railway Company.

The following list shows the membership and the delegates in attendance:

#### ACTIVE MEMBERS.

Allentown & Lehigh Valley Traction Company—A. F. Walter, James J. Boos.  
 Altoona & Logan Valley Electric Ry. Company.  
 Carbonale Traction Company—C. E. Flynn, P. T. Reilly.  
 Erie Electric Motor Company.  
 Electric Traction Company, Philadelphia.  
 Easton Transit Company—A. C. Rodenbaugh.  
 Harrisburg Traction Company—E. C. Felton, P. B. Musser.  
 Harrisburg & Mechanicsburg Electric Railway Company.  
 Greensburg, Jeanette & Pittsburg Street Railway Company.  
 Johnstown Passenger Railway Company.  
 Lehigh Traction Company.  
 Lebanon & Annville Street Railway Company—S. P. Light, C. H. Smith.  
 Middletown, Highspire & Steelton Railway Company.  
 New Castle Traction Company.  
 Pennsylvania Traction Company—Wm. B. Given.  
 Roxborough, Chestnut Hill & Norristown Railway Company—J. C. Lugar.  
 The Scranton Railway Company—Frank Silliman, Jr., C. A. Pearson, Jr., B. W. Gallagher.  
 Schuylkill Traction Company—E. W. Ash.  
 Schuylkill Valley Traction Company.  
 Schuylkill Electric Railway Company—C. P. King, D. J. Duacan.  
 United Traction Company, Reading—Norman M. Jones, John A. Rigg, Samuel E. Rigg, M. C. Aulenbach.  
 Union Traction Company, Philadelphia.  
 Wilkesbarre & Wyoming Valley Traction Company—John Graham, L. O. Hoover, James Fegan, Theo. S. Barber.  
 Williamsport Passenger Street Railway Company—E. H. Davis.  
 Warren Street Railway Company.  
 Washington Electric Street Railway Company.  
 York Street Railway Company—W. H. Lanius, C. H. Mayer.

#### ASSOCIATE MEMBERS.

J. G. Brill Company, Philadelphia.  
 James Boyd & Brother, Philadelphia.  
 Peckham Motor Truck & Wheel Company, New York city.  
 Pennsylvania Steel Company, Philadelphia—E. C. Felton, Mason D. Pratt.  
 John A. Roebling's Sons Company, Trenton, N. J.  
 Street Railway Advertising Company.  
 Lohdell Car Wheel Company.  
 Westinghouse Electric Manufacturing Company, Philadelphia—C. A. Bragg.  
 McKee, Fuller & Co.—B. F. Swartz.  
 The following companies were also represented:  
 Chester Traction Company—Robert F. Fox.  
 Lykens & Williams Valley Street Railway Company—Wm. E. Stewart.  
 American Rail Joint Company—W. E. Ludlow.  
 Mutual Indemnity Company, Scranton—Newton Jackson.  
 STREET RAILWAY REVIEW—H. J. Kenfield.  
 Street Railway Journal—J. E. Bennett.  
 The Municipal Record & Advertiser—C. L. F. Dubain.  
 Washburn & Moen Manufacturing Company, Worcester, Mass.—Theo. Dibble.  
 Webber Joint Manufacturing Company—E. W. Penfield.  
 Shelby Electric Company—O. D. Pierce.  
 J. H. Stedman, Transfer Expert—J. H. Stedman.  
 Elmer P. Morris, New York—C. J. Harrington.  
 Wm. Wharton, Jr., & Co.—R. K. Polk.

The Suffield & East Granby Street Railway Company has changed its name to the Hartford (Conn.) & Springfield Railway Company.

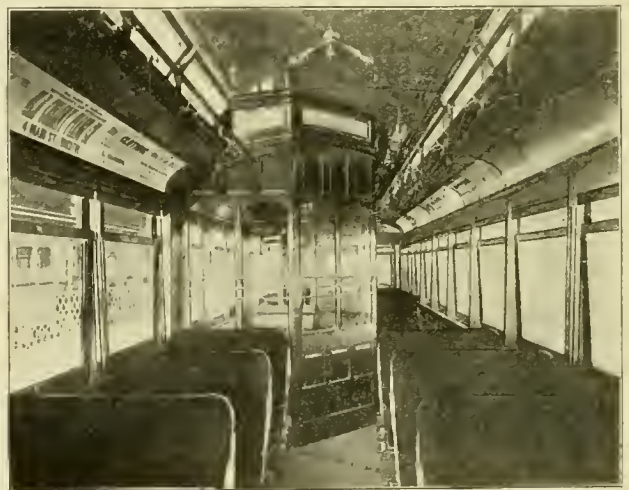
## PROVIDENCE & TAUNTON STREET RAILWAY.

The Providence & Taunton Street Railway is one of the recently completely interurban roads, and has the reputation of being one of the best ever built in New England. It connects the Union Railroad, Providence, with the Taunton Street Railway and its cars run over about 18 miles of track, though its own line is only 13½ miles; of this two miles are over a private right of way, which is fenced with wire, and the other 11½ miles along the side of the public highway. However, the highway was widened for a considerable portion of the route.

The interurban line is single track with turn-outs; the rails weigh 60 lbs. per yd., of T section in 60 ft. lengths, and are laid on chestnut ties 6 in. x 6 in. x 7 ft. spaced 24 in. apart between centers. The joints are made with 30-in. angle splice bars, with tie plates under the joints. The rails are bonded with the Brown plastic bonds. Split switches are used. The maximum grade is 5 per cent for 1000 ft.

The trolley line is of No. 00 copper carried on chestnut poles with side brackets made by the Hill Electric Company, New Bedford, Mass. The copper, 13½ miles of No. 00 trolley wire, and 13½ miles of 500,000-c. m. feeder wire, was all furnished by the American Electrical Works.

The rolling stock comprises 12 open and eight closed cars, 36 ft.



INTERIOR OF CAR.

over all, with cross seats. The bodies were built by the American Car Company, of St. Louis, and are mounted on Peckham No. 14 B double trucks, equipped with two 35-h. p. motors to each car. The New Haven Fare Register Company furnished the registers. To be prepared for winter the company has three Taunton snow plows.

The power station is about half-way between Providence and Taunton. It is a fine building, entirely of stone, brick and steel, about 75 ft. by 107 ft. The roof is of tar and gravel, carried on steel trusses. The stack is at the side of the power house, and is 115 ft. high with a flue 6 ft. 3 in. in diameter. The power house was built by J. W. Bishop & Co., Providence.

The engine and generator room is 50 ft. by 73 ft. 4 in., and contains two condensing engines built by E. P. Allis & Co., Milwaukee; they are of 650-h. p. and 350-h. p. and belted to generators of 500 and 225 k. w., respectively.

The boiler room is 60 ft. by 45 ft. 6 in. with three Babcock & Wilcox boilers of 250 h. p. each. Three feed water heaters and two separators made by the Austin Separator Company, Detroit, Mich., are used.

The valves throughout the station, and the condensers also, were furnished by the Chapman Valve Company, Indian Orchard, Mass.

The car house is 225 ft. by 55 ft. with capacity for 40 cars; the



walls are of brick and the roof is carried on steel trusses. Five tracks extend the entire length of the building.

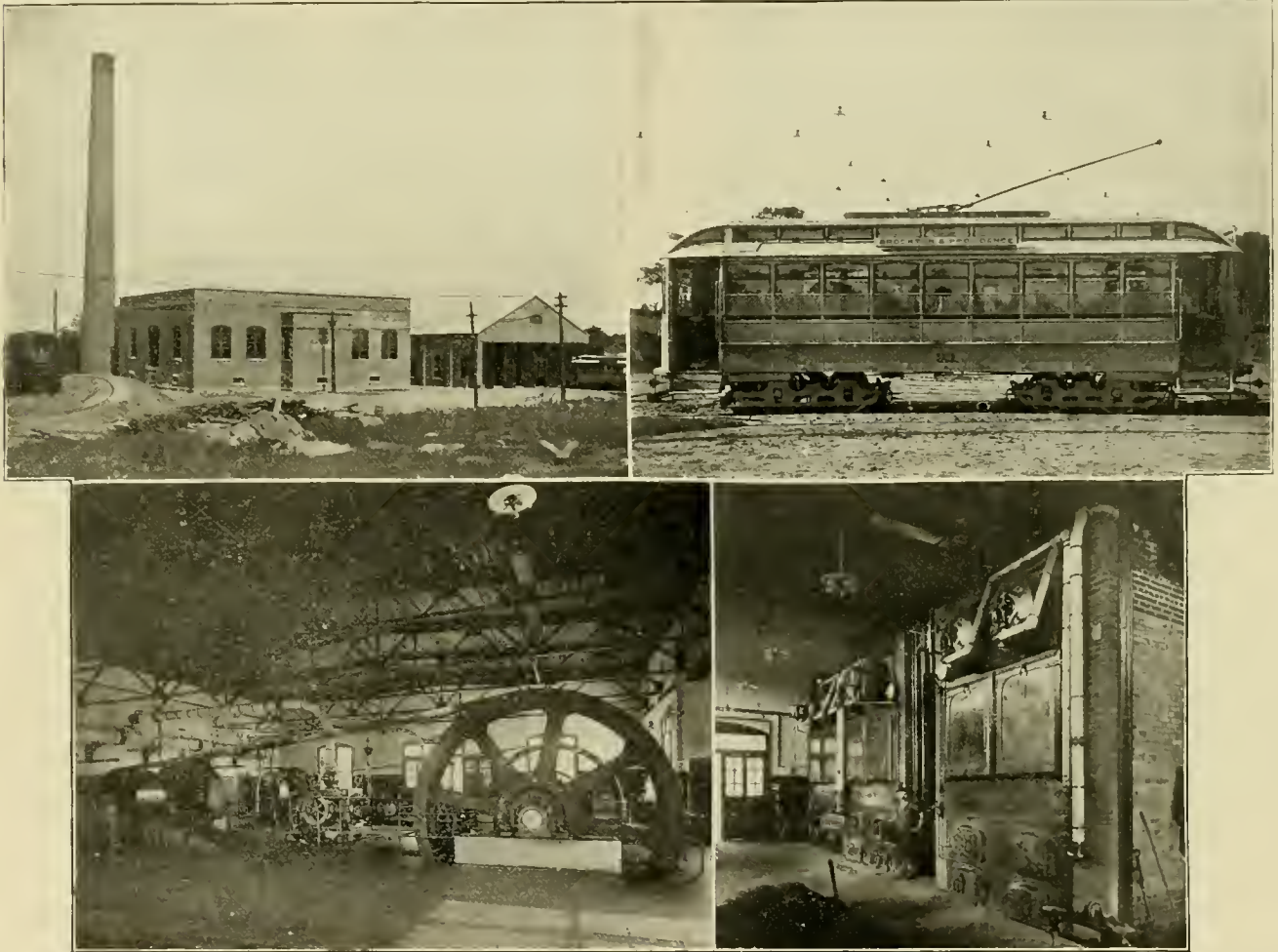
The route is over picturesque country roads, passing through one small village. The cars reach a maximum speed of 30 miles per hour, and the car mileage is 340 miles per day.

Between Providence and Taunton the fare by the Consolidated Railroad is 65 cents, and the route is not direct, while on the electric lines the fare is 25 cents. This 25 cents is collected in five installments, one by the Union Railroad, one for each of the four sections of the interurban.

The officers of the Providence & Taunton are: J. J. Whipple, president; George A. Butman, secretary; P. L. Saltonstall, treasurer; James F. Shaw, general manager; A. C. Ralph, superintendent.

## ANOTHER UNION DISBANDED BY A STRIKE.

The employes of the Citizens' Railway Company, of Waco, Tex., organized a union and about six weeks ago demanded a reduction in working hours at the same pay per day. As the business of the company would not justify any change it was refused by the officials. A strike was inaugurated, but Superintendent Rathell secured new men to take the places of the strikers. Attempts were made to blow the cars up with dynamite but these were not successful and only slight damage was inflicted. The result was a complete victory for the company, the strike being called off and the local union disbanded.



ALLIS ENGINES; B. & W. BOILERS; AMERICAN COMPANY'S CAR; PROVIDENCE & TAUNTON STREET RAILWAY.

ent. We are indebted to Mr. Shaw for the accompanying illustrations.

The road was built complete by James F. Shaw & Co., of Boston, the time being 50 days. Much rock was encountered in preparing the roadbed and six tons of dynamite was used for blasting.

The Brockton, Bridgewater & Taunton Street Railway has the same officers as the new interurban and in July was inaugurated a through car service over the two lines from Brockton to Providence (at the new station of the N. Y., N. H. & H. R. R.). The fare for the total distance, 35 miles, is 50 cents. Tickets are sold by the leading druggists in each city.

## STREET CAR MAIL SERVICE FOR SYRACUSE.

Arrangements have been completed for carrying mail pouches on the cars of the Syracuse Rapid Transit Railway Company. Two trips will be made daily between the city, East Onondaga, Onondaga Valley and Elmwood park. Each pouch will be in charge of the motorman of the car, who will be sworn in by the government officials. Positions on the cars carrying mail will be considered a promotion for the men accepting them. It is expected in the near future that another mail route will be established, and it will be only a question of a short time until regular mail cars will be put in operation.

It is stated that there are no less than five companies in the field for renewals of the franchises now held by the Richmond Railway & Electric Company but soon to expire.

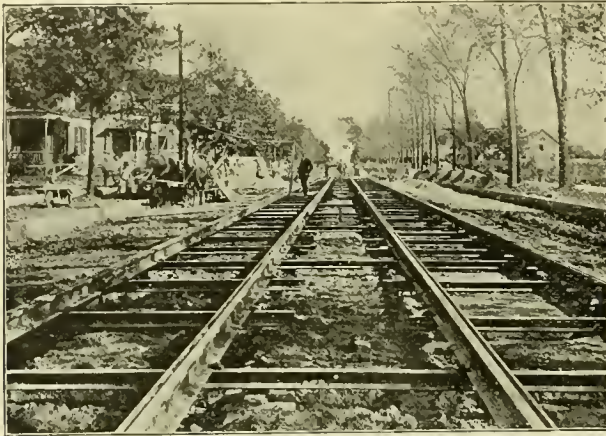
The Buffalo & Lockport road is stringing another feeder wire from Tonawanda to Lockport.

STEEL TIE CONSTRUCTION AT ROCHESTER, N. Y.

The Rochester Railway Company, Rochester, N. Y., has, during the past summer, completed some new track construction in which old steel rails have been used for ties. T. J. Nicholl, vice-president and general manager of the company, states that the reason he used the old rails for ties in this work was that no satisfactory market for them could be found, as large quantities of old rails are for sale in all parts of the country and the price low in consequence. After making trials of them in various

so that the upper surface is parallel to the beveled side of the tie rail flange. A 5/8 in. bolt secures the rail and tie sections and the engraving very plainly shows the rail and tie sections and the method of fastening them together.

These ties are placed 6 ft. apart and bedded in Portland cement concrete, extending 4 in. below the bottom of the tie. Under each track rail is a beam of concrete 12 in. deep under the rail base; these beams are 16 in. wide at a point 5 in. below the base of the rail and are beveled so that those under the inner rails are 12 in. wide at the bottom, and the outside ones 14 in. wide at the bottom. The track rails are imbedded 1 1/2 in. deep in the longitudinal beams.



SHOWING OLD-RAIL TIES.



PLACING CONCRETE.

ways the plans shown herewith were adopted and the construction seems to be very satisfactory. It is also economical, unless the old rail could be disposed of at a price much higher than can now be obtained. One reason for the low price prevailing is that the old rails for sale are of light section.

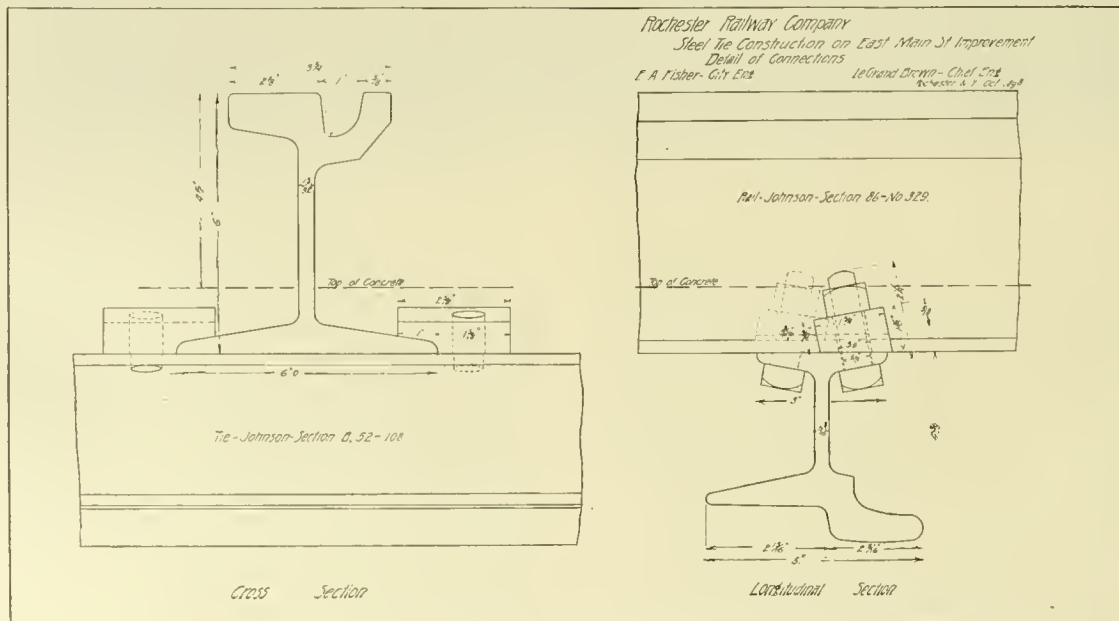
The new track is laid with grooved rails, 6 in. deep, with a 6-in. base; they are in 60-ft. lengths and weigh 86 lbs. This is the Johnson (Section 86-329) rail, made by the Johnson Company.

The ties are old 52-lb. rails. On single track the ties are 7 1/2 ft. long. On double track every third tie and all joint ties are 16 ft. long, and the intermediate ties 7 ft. long. The 16-ft. ties extend under and are fastened to all four track rails; they are bent in the center to conform to the street surface. The old-rail ties are inverted and the rails fastened to them by means of clamps; the clamps are 1 3/4 x 2 5/8 in., beveled on the under side

Between the rails and between the tracks a concrete foundation for the pavement is laid not less than 6 in. deep. Outside the rails the pavement foundation is also of concrete 6 in. deep. Under all the concrete work is a layer of stone chips and coarse gravel 4 in. deep, which is designed for sub-surface drainage and connected with the sewers.

The tracks were lined and surfaced and securely blocked with stones and wedges before concreting; care was taken that the mortar boards did not rest upon the rails until the concrete had set. Very little difficulty was experienced in keeping the alignment and surface correct until the work of concreting was finished.

The plan of the tracks and the sections of the street and of roadbed to larger scale are shown in the engraving reproduced from the engineer's drawings.



RAIL AND OLD-RAIL TIE, 1/4 ACTUAL SIZE, ROCHESTER, N. Y.





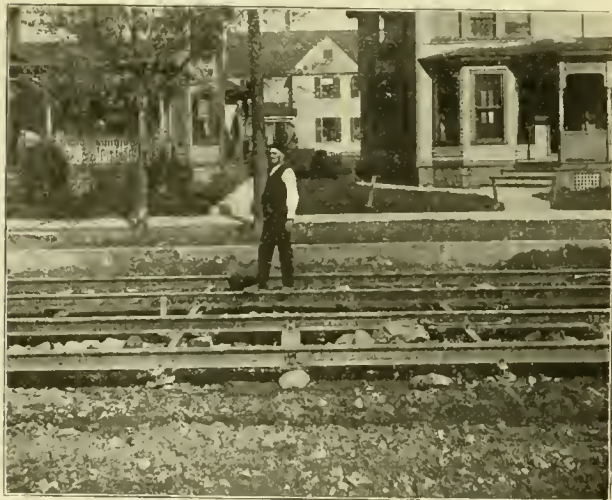
A short portion of track was laid with the Pennsylvania Steel Company's channel ties; these are 7 in. x 1 3/4 in. x 5-16 in. x 6 ft. Old-rail ties were used under the joints, however. With the channel ties angles are used for fastenings.



SHOWING PENNSYLVANIA STEEL COMPANY'S TIES.

The half-tone engravings are from photographs and show the steel tie construction on East Main street

For the photographs, drawings and data we are indebted to General Manager Nicholl, who developed the idea and general



SIDE ELEVATION OF TRACK.

plan of construction. The work has been under the direct supervision of Le Grand Brown, chief engineer of the Rochester Railway Company, and E. A. Fisher, city engineer of Rochester, who is in charge of the street improvements, has advised as to the details.

## STREET RAILWAYS IN GOTHENBURG, SWEDEN.

Under date of September 26, Robert S. S. Bergh, U. S. consul at Gothenburg, Sweden, gives the following particulars concerning the projected electric railways in that city. The committee appointed in March, 1897, has made a report recommending that the city should build an electric-power station and four electric tramway lines, overhead construction, the lines to be used by the present tramway company, on payment to the city of certain dues and a certain percentage of the profit; the company to provide the rolling material. The street railways will thus be used by the company for twenty years after they are finished, when the city

will purchase the rolling stock and undertake the management of the tramways.

The Gothenburg Tramways Company, which now uses horse power, has been granted a concession up to 1917; hence the above proposition is intended to be a compromise between the city and the company. Two other persons have asked for concessions to build electric tramways here; but the city has refused, on the supposition that it can make a satisfactory contract with the Gothenburg Tramways Company.

For several reasons, the committee has come to the conclusion that electricity is the best motive power for tramways, and that the overhead transmission system is the best

Siemens & Halske, of Berlin, have furnished the committee an estimate, from which it appears that the total cost of construction (value of sites for the buildings not counted and value of the old tramways deducted) will amount to about 1,870,000 kronor (\$591,160), of which the city's share would be 1,278,000 kronor (\$342,504). This last sum includes the cost of the power plant—360,000 kronor (\$96,480)—with cost of wire and tracks

It is estimated that the yearly running expenses will be 296,000 kronor (\$79,328), whereof the city's share will be 89,000 kronor (\$23,852). The yearly expenses to be paid by the city on account of the electric tramways will be: Sinking fund, interest, and installments on the loan, 64,000 kronor (\$17,152); running expenses, as above stated, 89,000 kronor; or altogether 153,000 kronor (\$41,064).

According to the proposed contract, the company will pay yearly to the city 8 per cent of the cost of construction of the roads (the power plant excluded), or 72,000 kronor (\$19,296); and certain dues per kilowatt, amounting per year to 86,010 kronor (\$23,051); or altogether 158,010 kronor (\$42,347). If the gross receipts of the company any one year exceed 400,000 kronor (\$107,200), the company must pay the city 12 per cent of the excess. The city has reserved rights to arrange cheap trips for working people before 8 o'clock in the morning and has stipulated that passengers who have paid regular fare on one tramway line may continue on another by paying half fare in addition to the sum first paid. The work shall begin in May, 1899, and two of the lines shall be finished before November, 1899, and the rest ready for traffic by September, 1900.

The cost of construction of the railways, with a length of 12,205 meters (13,347 yards), of which 11,925 meters (13,041 yards) is in double tracks, is calculated as follows:

Description.	To be paid by the city.		To be paid by the tramway company.	
	Marks.	\$	Marks.	\$
<b>Buildings:</b>				
Boiler and engine houses, with foundations and chimney .....	74,500	\$17,731		
Car depot and repair shop.....			98,000	\$23,344
Residence for managers, etc.....			24,100	5,735
Well and pipes for water supply and storehouse for coal.....	14,800	3,522		
Boilers and machinery (3 tubular boilers of 204 square meters—2,195 square feet—heating surface and overpressure of 10 atmospheres each; 3 standing condensing boilers, each normally of 230 horsepower, and at a speed of 125 turns 300 horsepower; 3 direct-coupled dynamos, each of 200 kilowatts and 550 volts, instrument dial and connections).....	302,500	71,994		
Cables, wires, etc., (double-working circuit, poles, and wall fastenings, wire connection between the rails for return current, feeding wires, etc.)....	292,400	69,592		
Rolling stock (5 motor cars, whereof 4 in reserve, with 16 seats and room for 24 standing passengers, and with 2 motors of 20 horsepower; 21 trail cars, whereof 10 closed and 11 open, each with room for 30 to 32 passengers).....			519,400	123,017
Tracks (24,130 meters of tracks, with rails weighing 62.51 kilograms—201.74 pounds—per meter, and stone pavement in the neighborhood of the rails).....	680,000	161,840		
<b>Special arrangements:</b>				
Movable crane and working machinery in the repair shop.....	5,000	1,140	12,080	3,037
Turntable.....			2,000	476
Sundry fixtures.....	1,000	238	7,800	1,856
Motors and transmissions in the workshop, uniforms, etc.....			27,720	6,597
Supervision, etc.....	50,000	11,900	30,000	7,140
<b>Total.....</b>	<b>1,420,200</b>	<b>338,097</b>	<b>721,700</b>	<b>171,761</b>
Less value of the old tramways.....			64,200	14,280
<b>Total.....</b>	<b>1,420,200</b>	<b>338,097</b>	<b>657,500</b>	<b>157,484</b>

The total is 2,077,707 marks (\$494,494), value of the sites for the buildings not counted.



## NEW YORK STREET RAILWAY STATISTICS.

The accompanying table gives a comparative statement of the receipts and expenditures per passenger and the cost of operation per car-mile on the principal street surface railroads of the state of New York for the year of 1897, as reported to the Board of Railroad Commissioners. The table presents the total number of passengers carried, the total car-mileage, the receipts from operation per passenger, the cost of operation per passenger, the receipts from all sources per passenger and the total expenditure, including all fixed charges, per passenger. It also shows the expenses of operation per car-mile, excluding fixed charges, and the expenses of the same operation including fixed charges. In making these various calculations the division of receipts, as reported by the railroad companies, were taken and in the case of companies paying a dividend on the stock of a lessor company as part rental, this payment was included in the calculation of fixed charges:

## TOO LARGE A BONUS.

In the supreme court Judge Spring has rendered his decision in the case of the Commercial National Bank, of Cleveland, against the Syracuse Rapid Transit Railway Company. It will be remembered that this bank holds \$49,000 worth of the company's stock, and that it applied for an injunction restraining the directors of the railway company from paying an extraordinary bonus of \$30,000 in cash and \$70,000 in capital stock to Edward C. Jones & Co. for negotiating a loan of \$200,000 for them. The injunction was granted, and in granting it Judge Spring took occasion to express a very emphatic opinion about such transactions. He said: "Any project which is founded upon an attempt of directors to enrich themselves out of the property of the corporation whose interests they are elected to conserve, must receive the condemnation of the court. The conduct of these directors in concealing from their principals the fact that a large bonus was to be paid to consummate these loans, is reprehensible. But when to that fact is added the information that these

### Street Surface Railway Receipts and Expenditures per passenger and cost of operation per car mile.

OPERATED WHOLLY OR IN PART BY MECHANICAL TRACTION.

NAME OF ROAD.	Number of passengers carried.	Total passenger car mileage.	BASED UPON GROSS EARNINGS FROM OPERATION.		BASED UPON RECEIPTS FROM ALL SOURCES, AND TOTAL EXPENDITURES IN CLUO INO FIXED CHARGES.		Cost of operation per car mile.	Total expenses per car mile, including fixed charges.
			Average earnings per passenger.	Average cost of operation per passenger.	Average receipts per passenger.	Average expenses per passenger.		
			Cents.	Cents.	Cents.	Cents.		
Albany .....	9,761,155	2,454,414	5.49	3.41	5.73	4.39	13.52	17.46
Auburn .....	1,492,934	406,483	2.91	2.26	4.01	2.90	8.28	10.66
Binghamton .....	3,476,191	853,500	4.09	2.45	4.16	5.71	9.98	15.11
Brooklyn City and Newtown .....	12,437,503	2,126,702	4.18	2.60	4.30	3.66	15.20	21.38
Brooklyn Heights .....	117,698,291	22,312,337	2.75	2.22	3.98	3.84	11.73	20.25
Brooklyn, Queens Co. and Suburbaa .....	16,811,882	3,820,850	4.34	2.60	4.40	4.73	11.45	20.80
Buffalo Railway .....	38,603,876	5,898,288	3.41	1.73	3.49	2.69	11.40	17.56
Buffalo and Niagara Falls .....	1,125,351	724,609	12.03	6.83	12.15	11.16	10.49	17.23
Coney Island and Brooklyn .....	8,616,768	2,919,921	3.19	2.14	3.28	3.19	10.49	15.66
Crosstown Street, Buffalo .....	14,611,805	2,215,854	3.91	2.70	3.84	9.81	10.22	12.54
Geneva, Waterloo and Seneca Falls .....	1,542,914	433,288	3.31	2.34	4.06	4.57	8.34	16.28
Glens Falls .....	1,076,508	375,000	5.34	2.29	5.55	3.23	6.58	9.42
Ithaca Street .....	1,470,782	307,220	4.01	2.88	4.82	4.18	13.77	19.99
Jamestown .....	10,808,403	3,539,974	4.62	2.47	4.68	3.79	7.53	11.57
Kingston .....	1,073,435	197,032	5.00	3.37	5.16	4.28	18.07	23.32
Metropolitan, N. Y. (a) .....	234,705,704	30,081,352	3.79	2.05	4.02	8.41	15.99	26.59
Nassau, Brooklyn .....	43,577,056	10,660,181	4.04	2.17	4.19	4.03	9.81	16.46
Newburgh .....	1,418,394	377,062	5.86	3.50	5.90	5.81	13.18	21.86
Niagara Falls and Lewiston .....	308,365	150,269	26.11	8.93	28.32	17.55	18.15	36.01
Niagara Falls and Suspension Bridge .....	1,504,483	966,549	3.93	2.77	5.94	5.51	11.37	21.78
New York and Queens County .....	8,089,176	1,490,000	5.00	2.87	5.84	5.54	16.60	32.03
Rochester .....	21,717,803	4,909,681	3.71	2.49	3.80	3.93	11.62	17.87
Syracuse Rapid Transit (b) .....	10,401,141	2,868,340	3.97	2.58	4.30	3.58	9.37	12.97
Third Avenue, N. Y. .....	61,727,915	12,823,080	4.21	2.33	4.27	2.93	11.24	14.10
Troy City .....	10,808,403	3,539,974	4.62	2.47	4.68	3.79	7.53	11.57
Union, N. Y. (c) .....	14,337,913	3,964,818	5.01	2.12	5.04	4.36	11.28	15.05
Utica Belt Line .....	3,470,530	879,333	4.76	3.07	4.81	4.50	12.13	17.78
OPERATED WHOLLY BY ANIMAL POWER.								
Central Crosstown, N. Y. .....	16,158,814	1,931,537	3.53	2.54	3.55	3.20	21.25	26.75
Dry Dock, East Broadway and Battery .....	19,389,638	2,397,323	3.55	2.68	3.60	3.36	21.62	27.17
Forty-second St., Manhattanville and St. Nich. Ave. .....	19,657,615	2,539,974	3.65	3.07	3.69	3.65	17.07	20.26
Second Avenue .....	17,455,287	3,558,662	4.01	3.47	4.03	4.16	17.04	20.41
Thirty-fourth Street Crosstown .....	13,115,813	909,198	2.58	1.31	2.59	1.36	17.49	19.66
Twenty-eighth and Twenty-ninth Sts. Crosstown .....	1,279,203	231,033	3.47	2.98	3.47	3.05	13.17	16.89

(a) Includes all lines controlled by Metropolitan Street Railway Company not making separate reports.  
 (c) Includes Westchester and Southern Boulevard Companies.

(b) Includes all lines operated by the Transit Company.

## ELECTRIC TRACTION IN NEW SOUTH WALES.

The report of the Department of Public Works of New South Wales for the fiscal year ending June, 1897, recently received gives some information that is interesting though it is over a year old. During that year an extension of nearly 1½ miles of the Military Road Electric Tramway, from Spit-road to Mosman's Bay, was completed and notwithstanding the heavy grades its working has been pronounced satisfactory. Various other electric extensions have been authorized and a section of the existing cable road is to be equipped for electricity. The overhead trolley system has been adopted for the George street and Harris street line, some 3¼ miles of double track, after a very careful investigation of the merits of all systems.

The city council of London, Ontario, has proceeded against the street railway company to restrain it from advertising in its cars.

same agents were to pay themselves, with lavish liberality, for performing their trust, their conduct descends to a degree of culpability, especially shocking when the reputation of the men enlisting in the enterprise is considered. The principle that the directors of a corporation cannot profit out of the directorship to the detriment of the incorporators, is elementary. Their acts are always subjected to jealous scrutiny. They bear a fiduciary relation to the stockholders of the company. They are the trustees of its property. As was said by Judge Grooves in *Coleman vs. Second Avenue Railway Company*, 38 N. Y., 201-202, they cannot make a bargain with themselves binding upon the company."

The Ottumwa (Ia.) Electric Railway Company in addition to its railway business lights the city and heats the business portion with exhaust steam, and has found the combination a profitable one. It has just completed a mile of new track laid with 60-lb. rails. In the power house a counter shaft has recently been installed which enables the long shaft to be shut down when the load is light.

## NOTICES TO THE PUBLIC IN STREET CARS.

## The Practice of Different Companies as to the Posting of Notices in Their Cars—The Different Classes of Such Notices—Style and Arrangement of Notice Cards.

We have learned of several managers who contemplate making changes in the notices posted in the cars under their charge, and this leads us to believe that information as to what notices are so posted by various companies will be of general interest.

In response to a request the managers of over 20 companies have sent us copies of the notices posted in their cars, which will be found in what follows. Such printed cards as were received have been reproduced in order that the style of type adopted and the arrangement might be better shown. The dimensions and color of the paper and the color of the ink are given when possible.

Taking up the 21 companies whose posted rules are given here, it is seen that these rules may be divided into four classes:

1. Those intended for the protection of the general public, that is, for the promotion of the comfort or health of all the passengers, as endangered by the acts of fellow passengers.
2. Those intended for the protection of the individual passenger against his own carelessness.
3. Those for the information or convenience of the passengers.
4. Those for the protection of the company.

By rules which we have placed in class 1, three companies prohibit the presence of intoxicated or disorderly persons in the car; sixteen post rules in an endeavor to abate the spitting nuisance, which for the most part are enforced by the city; eight post notices as to where passengers are permitted to smoke.

By the rules of class 2, sixteen companies caution against, or prohibit, getting off or on the car when it is in motion; ten caution against, or prohibit, standing on the platforms or running boards; four caution more particularly against passengers using the front platform; two instruct passengers how to alight so as to avoid injury; two instruct them to get off on the right hand side; and four add directions to look both ways or look and listen before attempting to cross the tracks. Several caution passengers against obtruding any part of the person out of the windows or beyond the sides of the cars.

By rules of class 3, seven companies give information as to the fare; three, the amount of change which a conductor may be called upon to furnish; two, information as to carrying luggage; six, as to where the car will stop; two, as to signaling conductor or motorman; five, as to transfers; one, as to demanding transfers; one, as to the newsboys selling papers; one, as to the use of bell cord; and seven companies advise passengers that courteous conduct is required of employes and request complaints to be made to the manager if the men fail in this duty.

By those of class 4, five companies prohibit conversation with the motorman or unnecessary talking to the conductor; one publishes an ordinance imposing a penalty for refusing to pay fare; one publishes a state law against the misuse of transfers. There are a number of rules given in class 3 which may, perhaps, be said to belong in class 4 also, since they are indirectly for the protection of the company, but this may be said of all the rules usually published. A number of companies add to the rules a declaration that if they are disregarded the company will not be responsible for accidents, but it may be doubted whether these statements are of much legal value.

Seven companies state that they post no rules for the guidance of passengers.

There is quite a variety in the language in which the rules are couched, but the authority on which the rule rests is usually cited when it affects "spitting" or "dishonesty."

One gentleman makes what appears to us to be a good point when he says that rules in small type do not attract attention. Where it is desired to print a lengthy extract of a law or ordinance, comparatively small type must be used, but the disadvantage of its use is obviated if there be a line of large type stating what is forbidden by the authority cited; a number of examples of such arrangement will be found in what follows.

The Rochester (N. Y.) Railway Company displays three printed

signs in its cars. No. 1 is printed in red, on a white card, 8 in. by 12 in.; No. 2 is printed in red and black, on a sheet 22 in. long by 14 in. high. No. 3 is printed in red and black, on a white card 14 in. by 22 in.; on this sign only the words, "Take Warning!" in the left hand portion and the cross on the right hand portion are in red; the black lettering shows through the red ink of the cross, and is quite legible.

The New Orleans Traction Company, operating the Crescent City Railroad and the New Orleans City & Lake Railroad displays three signs in the cars. They are all printed in two colors. No. 1 is a notice to passengers printed in black and red on a card 20½ in. long by 9 in. high. No. 2 is in red and blue on a card 13½ in. wide by 16 in. high and gives information as to transfers, special cars, and attractions. No. 3 is printed in blue and red on a card 13½ in. long by 10½ in. high, and is a special notice as to cars for trolley parties.

W. F. Kelly, general superintendent of the Columbus (O.) Street Railway Company, states that the company has no rules posted in its cars, except a copy of an ordinance prohibiting spitting in the cars. This is printed on a card 11 in. by 21 in., and is shown on a reduced scale herewith.

The Quebec, Montmorency & Charlevoix Railway, Quebec, Canada, is quite fortunate in operating under what is known as the "Dominion Railway Act," which subjects passengers to heavy penalties for violating the rules.

The notices posted in all the cars are as follows:

## TARIFF

The rate of fare is as follows:

For each passenger, 5c.; Children under the age of 7 years, not occupying a seat, and accompanied by their parent or guardian, will be carried FREE.

Tickets are sold and accepted on this Company's cars at the following rates:

Regular tickets, good at all hours of the day—6 for 25c., or 25 for \$1.00.

Workmen's Tickets, good only from 6 to 8 a. m., and 5 to 7 p. m., 8 for 25c.

Children under 14 years of age and attending the schools of Quebec, can procure Special Tickets at the rate of 10 for 25c., on the presentation of a certificate from Teacher at the Company's Office.

E. A. Evans, Manager.

## NOTICE TO PASSENGERS.

Conductors are not bound to give change for more than two (\$2) dollars; should a higher amount be tendered him, and he is unable to supply change, the passenger will be required to leave the car and procure the change elsewhere.

E. A. Evans, Manager.

In open cars there are also the following notices:

## NOTICE.

Smoking is only allowed on the two rear seats of open cars.

E. A. Evans, Manager.

## INSTRUCTIONS TO PASSENGERS.

1. Do not get on or off the car while the car is in motion.
2. Do not get on or off the car, except by the Running Board on that side nearest the sidewalk.
3. Do not stand on the Running Board while the car is in motion, or put your arms or head outside of the posts of the car. IT IS DANGEROUS.
4. Do not talk to the Conductor or Motorman; the Conductor will answer all reasonable questions, the Motorman's duty is to operate the car. In the event of any incivility or inattention, report the same to the manager's office.
5. Persons under the influence of liquor, or acting in a disorderly or violent manner, will not be allowed on the cars.

E. A. Evans, Manager.



# ...To Passengers...

If you wish a Transfer, ask for it when you pay your fare. Examine Transfer Ticket as soon as you receive it. If date, hour or line is punched wrong, notify conductor at once, so correction can be made.

T. J. NICHOLL, GENERAL MANAGER.

ROCHESTER, N. Y.—NO. 1.

## NOTICE.

By Section 619 A of the Penal Code of the State of New York, it is provided that any person in possession of a transfer regularly issued to him or her, or who shall have otherwise obtained possession of the same, who shall sell or give away such transfer to a person not entitled thereto, and any person who shall have received a transfer, not regularly issued to him or her as a passenger, who shall offer the same for passage upon any car of this Company, is guilty of a misdemeanor and subject to a penalty of \$500, or imprisonment for one year, or both.

ROCHESTER RAILWAY COMPANY,  
By T. J. NICHOLL, Gen'l Manager.

## PASSENGERS TAKE WARNING!

TO INSURE PERSONAL SAFETY, YOU ARE WARNED NOT TO PROJECT ANY PART OF THE BODY BEYOND THE SIDES OF THE CAR, NOT TO GET ON OR OFF CARS WHILE IN MOTION, AND NOT TO GET ON OR OFF THE FRONT PLATFORM OF CARS. A VIOLATION OF THIS WARNING WILL BE AT THE RISK OF THE PASSENGER.

CARS STOP ONLY ON FARTHER CROSSING.

**SMOKING IS NOT ALLOWED ON THIS CAR**  
T. J. NICHOLL, Gen. Manager.

ROCHESTER, N. Y.—NOS. 2 AND 3.

## DON'T SPIT IN THIS CAR

AN ORDINANCE

No. 12,620. To prevent Expectoring in Churches, Halls, Theaters or Public Conveyances in the City of Columbus, Ohio.

SECTION 1 Be it ordained by the City Council of the City of Columbus Ohio That it shall be unlawful for any person or persons in any church theater public hall or in any street car or public conveyance within the City of Columbus to expectorate on the floor or any portion of the interior of said church theater or public hall, or on the floor platform or any portion of the interior or outside of said car or other public conveyance, provided, however that an conviction shall be had hereunder unless a copy of this ordinance be posted in said church, theater, public hall, street car or other public conveyance

SEC 2 Any person violating the provisions of this ordinance shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined in any sum not exceeding Five Dollars \$5, or be imprisoned not more than one (1) day, or both

SEC 3 This ordinance shall take effect and be in force from and after its passage and publication according to law

Passed June 14 1897  
Approved by the Mayor June 18 1897

MARE ELLEMAN President of the City Council.  
JOHN M. DOANE City Clerk

COLUMBUS, O., STREET RAILWAY COMPANY.

## NOTICE TO PASSENGERS.

Passengers BOARDING or LEAVING Car while it is in motion, do so at their OWN RISK.  
No INTOXICATED or disorderly person, or one violating public decency, WILL BE ALLOWED UPON THE CAR.  
FULL FARE will be charged for all persons, excepting Children under THREE YEARS of age, when NOT OCCUPYING seats.  
Change to the amount of TWO DOLLARS only, will be furnished by Conductors.  
SPITTING on the floor of Car is prohibited by Ordinance No.13,073,C.S. There is no room in car for Luggage, or Bulky Packages. If carried on rear platform, are there at owner's risk.  
EMPLOYEES are required to be obliging and courteous at all times. Complaints of neglect in this respect, or failure to please from any other cause, will be gladly received and given prompt attention at the office of the Company, corner Magazine and Pleasant Streets.

NEW ORLEANS TRACTION—NO. 1.

# Don't think the Season for TROLLEY PARTIES IS OVER

WE HAVE SPECIALLY ILLUMINATED CLOSED CARS,

IF YOU THINK THE OPEN ONES TOO COOL.

SPECIAL CARS FOR THEATRE, BALLS, ETC.

APPLY FOR RATES AT

Tel. 581. Office, Cor. Magazine and Pleasant Streets.

## INFORMATION! ESPLANADE LINE.

TRANSFERS are issued to and from French Market and Villere Lines

at Villere Crossing, from 5:15 o'clock A.M. to 9:15 P.M.

OWL CARS ARE RUN AS FOLLOWS:

Leave CANAL ST., 1:00, 2:00 3:00, 4:00, 5:00.

Leave ESPLANADE ST'N, 12:36, 1:36; 2:36, 3:36, 4:36.

RACES during the Season.

A full line of Cars will be operated to and from the Track. This is the QUIKKEST, and by far the PLEASANTEST ROUTE to the RACES.

CITY PARK== This Line affords the best Accommodation to this HISTORIC and DELIGHTFUL RESORT.

Special Information furnished at Starter's Office, Canal and Carondelet Sts., or Main Office, Magazine and Pleasant Sts.

H. J. DRESSLE, Superintendent. E. D. WYMAN, General Manager.

NEW ORLEANS TRACTION—NOS. 2 AND 3.

In the closed cars the corresponding notices are:

NOTICE

Smoking or spitting is strictly forbidden on this Company's cars.

The Conductor has orders to eject any Passenger violating this rule.

E. A. Evans, Manager.

INSTRUCTIONS TO PASSENGERS.

1. Do not get on or off the car while the car is in motion.
2. Do not get on or off the car, except by the rear vestibule, and on that side nearest the sidewalk.
3. Do not stand in the vestibule or on the steps of the car.
4. Do not talk to the Conductor or Motorman; the Conductor will answer all reasonable questions, the Motorman's duty is to operate the car. In the event of any incivility or inattention, report the same to the Manager's office.
5. Persons under the influence of liquor, or acting in a disorderly or violent manner, will not be allowed on the cars.
6. Passengers are warned against the practice of putting their arms or heads out of the car windows. IT IS DANGEROUS.

E. A. Evans, Manager.

The Omaha & Council Bluffs Railway & Bridge Company has "notices to passengers" in four forms as shown in the first four of the accompanying reproductions, adapted to the different sizes of open and closed cars. These are Forms 1, 2, 3 and 4, respectively. In addition to these notices all cars have the notice as to spitting on the floor (Form 33). All these are printed in black ink on white cards 15½ in. long by 6¼ in. high.

An old style notice no longer used is shown also; this was printed in blue on a card 14 in. long by 16¼ in. high.

The Citizens' Street Railroad Company, of Indianapolis, Ind., has six signs posted in its cars. These are all shown in the accompanying cut. The one shown at the top is printed in black on a white card 7½ in. by 18 in. The second is in black on a card 6½ in. by 21 in. The third notice is printed all in black, except the last line, which is in red; the card is 7 in. by 21 in. The fourth is in black on a card 7 in. by 22 in. The fifth is in black on a card 6¾ in. by 23½ in. The bottom one is printed in black on a card 10½ in. by 27 in.

The Louisville (Ky.) Railway Company has the notices shown reduced in the accompanying cuts; one is printed in blue ink on a white card 20 in. long by 7½ in. wide; the other is the spitting notice printed in black letters with red shading on a white card 14 in. long by 5½ in. high.

The Metropolitan Street Railway Company, of New York, has a sign printed in black ink on both sides of a sheet of white paper, 4¼ in. wide by 16 in. long, so that it may be framed between two panes of glass and be seen from either side. It is shown reduced in the cut.

The Canal & Claiborne and the New Orleans & Carrollton Railroads, of New Orleans, which are both under the management of George H. Davis, have a sign displayed in the cars which reads as follows:

WARNING.

Keep your head, arms and body inside of the car.  
Do not get on or off cars while they are in motion.  
Do not ride on the platform, or on the step.  
Always stop, look and listen, before crossing the tracks.  
Do not spit upon the floor, under penalty of the law.  
Change, to the amount of \$2.00 only, will be furnished by the conductor.

C. S. Sergeant, second vice-president of the Boston Elevated Railway, advises us that the company has no printed rules for passengers other than the following.

"No smoking."

"Do not talk to the motorman"

"Spitting in this car is forbidden by the Board of Health. Penalty, \$100."

"All persons are warned not to enter or leave the car while it is in motion, or by the front platform. No disorderly or otherwise obnoxious person, whether or not under the influence of liquor, will be permitted to ride upon this car," and painted on the outside of the car. "Getting on or off the car by the front platform is strictly prohibited. Persons riding on the platform do so at their own risk."

The Union Traction Company, of Philadelphia, has three notices to the public; they are all printed on white cards 12 in. long and 8 in. high. They are framed and two of each are placed in

## NOTICE.

Passengers are **FORBIDDEN** to **SPIT** on the **FLOOR** of this Car.

By Order of

**BOARD OF HEALTH**

## Rate of Fare.

Single Fare, = = = 5 Cents.

Exchange Ticket, - - - 8 "

Children Under 3 Years of Age, - - - Free.

Exchange Tickets will be accepted by the Conductors for Fare at the **JUNCTION OF STREETS NAMED ON THE TICKET**, or from a point North of Junction if the car is going North, South of Junction if the car is going South, East of Junction if the car is going East, or West of Junction if the car is going West, **BUT IN NO CASE TO BE ACCEPTED BEFORE THE JUNCTION IS REACHED.**

January 1, 1898.

• UNION TRACTION COMPANY.

## NOTICE.

Passengers **MUST NOT** get **OFF** or **ON** the Car at Street Crossings until it is stopped at the far side of the intersecting Street.

UNION TRACTION, PHILADELPHIA.

each car, along the sides between the windows.

No. 1 is printed in red and blue, No. 2 in red and black, and No. 3 in brown.

On the lines of the Birmingham (Ala.) Railway & Electric Company, a notice, "Do not talk to the motorman," printed in black ink on a blue card 4 in. by 10 in., is placed in all cars. On



NOTICE TO PASSENGERS.

- 1 PASSENGERS MUST NOT GET ON OR OFF CARS WHILE IN MOTION IT IS DANGEROUS
- 2 Cars stop on far side of cross streets
- 3 Passengers wishing to GET ON THE CAR must be on the far side of cross street and SIGNAL TO THE MOTORNEER
- 4 Passengers wishing to LEAVE THE CAR should NOTIFY the CONDUCTOR ONE OR MORE BLOCKS IN ADVANCE of their DESTINATION
- 5 Passengers are requested to NOT RIDE on the PLATFORM or STEPS IT IS DANGEROUS
- 6 Passengers are not allowed to ride on the front platform.
- 7 Transfers are only good where lines intersect, fifteen minutes after time punched.
- 8 Bell cords are intended for the use of Conductors only
- 9 No smoking allowed in this car

W S DIMMOCK, Gen'l Supt.

NOTICE TO PASSENGERS.

- 1 PASSENGERS MUST NOT GET ON OR OFF CARS WHILE IN MOTION IT IS DANGEROUS
- 2 Cars stop on far side of cross streets
- 3 Passengers wishing to GET ON THE CAR must be on the far side of cross street and SIGNAL TO THE MOTORNEER
- 4 Passengers wishing to LEAVE THE CAR should NOTIFY the CONDUCTOR ONE OR MORE BLOCKS IN ADVANCE of their DESTINATION
- 5 Passengers are requested NOT TO RIDE on the PLATFORM or STEPS IT IS DANGEROUS
- 6 Passengers are not allowed to ride on the front platform.
- 7 Transfers are only good where lines intersect, fifteen minutes after time punched.
- 8 Bell cords are intended for the use of Conductors only TO ATTRACT CONDUCTOR'S ATTENTION PRESS BUTTON BETWEEN THE WINDOWS
- 9 No smoking allowed in this car.

W S DIMMOCK, Gen'l Supt.

NOTICE TO PASSENGERS.

- 1 PASSENGERS MUST NOT GET ON OR OFF CARS WHILE IN MOTION IT IS DANGEROUS
- 2 Cars stop on far side of cross streets
- 3 Passengers wishing to GET ON THE CAR must be on the far side of cross street and SIGNAL TO THE MOTORNEER
- 4 Passengers wishing to LEAVE THE CAR should NOTIFY the CONDUCTOR ONE OR MORE BLOCKS IN ADVANCE of their DESTINATION
- 5 Passengers are requested to NOT RIDE on the PLATFORM or STEPS IT IS DANGEROUS
- 6 Passengers are not allowed to ride on the front platform.
- 7 Transfers are only good where lines intersect, fifteen minutes after time punched
- 8 Bell cords are intended for the use of Conductors only TO ATTRACT CONDUCTOR'S ATTENTION PRESS BUTTON ON SACK OF SEAT
- 9 Smoking allowed on rear three seats

W S DIMMOCK, Gen'l Supt.

NOTICE TO PASSENGERS.

- 1 PASSENGERS MUST NOT GET ON OR OFF CARS WHILE IN MOTION IT IS DANGEROUS
- 2 Cars stop on far side of cross streets
- 3 Passengers wishing to GET ON THE CAR must be on the far side of cross street and SIGNAL TO THE MOTORNEER
- 4 Passengers wishing to LEAVE THE CAR should NOTIFY the CONDUCTOR ONE OR MORE BLOCKS IN ADVANCE of their DESTINATION
- 5 Passengers are requested to NOT RIDE on the PLATFORM or STEPS IT IS DANGEROUS
- 6 Passengers are not allowed to ride on the front platform.
- 7 Transfers are only good where lines intersect, fifteen minutes after time punched
- 8 Bell cords are intended for the use of Conductors only TO ATTRACT CONDUCTOR'S ATTENTION PRESS BUTTON ON SACK OF SEAT
- 9 Smoking allowed on rear four seats

W S DIMMOCK, Gen'l Supt.

NOTICE TO PASSENGERS.

SPITTING ON THE FLOORS OF PUBLIC PLACES AND OF PUBLIC CONVEYANCES IS A NUISANCE. IT IS A MEANS OF CONVEYING DISEASE; HENCE, FOR SANITARY REASONS IS HEREBY FORBIDDEN. OFFENSES AGAINST ORDERS OF BOARD OF HEALTH WILL BE PROSECUTED UNDER CITY ORDINANCES.

W. S. DIMMOCK, Gen'l Supt

OMAHA & COUNCIL BLUFFS.

REGULATIONS

OF THE METROPOLITAN STREET RAILWAY COMPANY.

PASSENGERS ARE FORBIDDEN to ride on the steps, or to get on or off or occupy the Front Platform of the Car, to occupy the Rear Platform while there is standing room inside the Car; to get on or off the Car while in motion. Passengers must get off the Rear Platform on that side of the Car nearest the Sidewalk. Children cannot be allowed to ride on either Platform. NO HALF FARE. Children under FOUR years of age, when accompanied by their parents or guardians, will be carried free. All children occupying seats will be charged full fare. The cars will be stopped at the lower crossing going down, and at the upper crossing going up town. Passengers must not put their hands or arms out of the windows nor upon the window frames. No trunk or large parcels will be carried. All packages are carried only at the owner's risk. Passengers can assist the management of this Company in enforcing its Rules by reporting any violation on the part of the Employees of the Company. The Company will not be responsible for any accident resulting from violation of either of the foregoing rules.

METROPOLITAN STREET RAILWAY COMPANY.

METROPOLITAN STREET RAILWAY, NEW YORK.

WARNING TO PASSENGERS.

PASSENGERS ARE FORBIDDEN to get on or off the Cars while in motion, or to leave the Cars on the side nearest the other track unless transferred to another Car by the Driver.

PASSENGERS ARE WARNED of the danger of being run over when they leave the Car by Cars approaching in either direction. This Company will not be responsible for an accident occurring under violation of foregoing rules.

T. J. MINARY, General Manager,

LOUISVILLE, KY.

LOUISVILLE RAILWAY COMPANY.

NOTICE TO PASSENGERS.

Do Not get off or on Cars while in motion. IT IS DANGEROUS!

When leaving car, face direction train is going, getting off on RIGHT HAND SIDE.

Trains Stop Only on Far Side of Cross Streets.

SMOKING ALLOWED ONLY ON FOUR REAR SEATS OF THIS CAR.

W S DIMMOCK, Gen'l Supt.

OMAHA & COUNCIL BLUFFS—OLD STYLE.

NOTICE!

All employes are instructed to be polite and courteous in the discharge of their duties. Conductors are specially instructed to call the names and numbers of all streets and answer all inquiries politely. Patrons will confer a favor by reporting to the management any breach of these instructions.

GENTLEMEN

Will not Spit upon the Floor of this Car.

NOTICE!

Children under FIVE YEARS of age, accompanied by parents or guardian, allowed to ride FREE. All children over FIVE years of age will be charged FULL FARE FIVE CENTS. PASSENGERS MUST NOT GET ON OR OFF THE CAR WHILE IT IS IN MOTION.

NOTICE!

Passengers will take notice of the following ordinance of the City of Indianapolis, which is hereby published pursuant to said ordinance.

"SECTION 1. Be it ordained by the Common Council and Board of Aldermen of the City of Indianapolis, That it shall hereafter be unlawful for any person to Smoke a Cigar, Cigarette or Pipe in any Street Car in the City of Indianapolis, while the same is carrying passengers or waiting on any public street for passengers in said City. Any person violating the foregoing provision shall be fined in any sum not exceeding One Hundred Dollars to which may be added imprisonment not exceeding thirty days, on complaint of any citizen before the Mayor."

NOTICE!

Passengers are FORBIDDEN to get On or Off this Car While it is in Motion.

THE CITIZENS STREET RAILROAD COMPANY.

NOTICE TO PASSENGERS.

Passengers Asking for Transfers Must Comply with the Following Rules:

- 1 Ask for your transfer tickets before you pay your fare.
- 2 See that your TICKET is CORRECTLY PUNCHED for the DATE, TIME of TRANSFER and the LINE to which you wish transfer. Before noon, the line should be punched in the light column, after noon in the dark column.
- 3 TAKE CARE for which your TRANSFER TICKET is PUNCHED, at the FIRST JUNCTION point with the line.
- 4 TRANSFER TICKETS GOOD ONLY on the FIRST CAR PUNCHED the previous point after the time punched on ticket. No transfer will be received back passengers paying on the way between junctions.
- 5 Only one transfer in afternoon.
- 6 A passenger occupying a transfer ticket must leave the car at transfer point or destination point and transfer ticket good.
- 7 Children will punch only the ticket for receipt when the line will be punched street, such as street cars, but will transfer to street cars after the car has passed the first junction point.
- 8 Tickets punched for Virginia, Massachusetts, St. Louis, St. Washington, St. Charles, St. Chicago are good to any car on street car line when up to the car station at that time.
- 9 Passengers for points beyond the street line must have specific line marked on the ticket.
- 10 All transfers for afternoon transfer must not be received in the morning.

CITIZENS' STREET RAILROAD, INDIANAPOLIS, IND.

SPITTING IN THIS CAR OR ON THE FLOOR, OR PLATFORM POSITIVELY PROHIBITED

BY AN ORDINANCE, APPROVED MAY 21st, 1897.

LOUISVILLE, KY.

all open cars is posted a notice in black ink on a red card 20 in. by 6 in. which reads:

"Smoking not allowed in this car except on the two rear inside seats."

Some cars have no conductors, and in these are displayed three signs in addition to the others. The first is printed in black ink

**NOTICE!** 1 Cars Stop only on Far Side of Street. 2 Ring the Bell half way between the Block to STOP at the next street. Outside the City Limits one ring means to stop at the next Station. 3 Don't put your Arms or Head out of the Windows. It is DANGEROUS. 4 Please Report any Inattention or Misconduct of Employees. 5 Children Five (5) Years of Age must pay FULL FARE. 6 DON'T SPIT ON THE FLOOR!

**Birmingham Railway & Electric Company.**  
J. B. MCCLARY, GENERAL MANAGER

**WARNING!** This Company will not be Responsible for Injuries received from Jumping on or off the Cars while in Motion.

All Persons are Warned NOT to stand on the Platforms or Running Boards  
In alighting from Car, look BOTH WAYS.

**Birmingham Railway & Electric Company,**  
J. B. MCCLARY, GENERAL MANAGER

BIRMINGHAM, ALA.

on a white card 14 in. long and 7½ in. high, and is a notice directing the passenger to "please deposit his fare in the front box," the usual sign that was to be found in conductorless horse cars. The second is printed in black ink on a white card 11 in. by 5½ in., and quotes a section of the city code which prescribes a fine of from one to fifty dollars as the penalty for refusing to deposit the fare as required or for attempting to defraud the company by placing anything except lawful money in the fare boxes. The third sign is a notice as to where the car stops, reporting incivility or misconduct of employes, children's fares, etc.; this is the upper one of the two reproduced. It is printed in blue ink on a white card 26 in. long and 4 in. high.

In all cars is a warning against boarding or leaving the car when it is in motion, or standing on the platform, and an in-

## SECTION 476

— OF THE —

### CITY CODE OF BIRMINGHAM.

It shall be unlawful for any person to ride on said cars without first paying full fare, as required by the Street Railroad Companies, or to place in the boxes provided for the reception of the fare anything except checks or lawful money of the United States. Any person violating the provisions of this Section shall be fined not less than One nor more than Fifty Dollars.

BIRMINGHAM, ALA.

junction to look both ways before crossing double tracks. This is the lower of the two Birmingham signs that are reproduced.

The Denver (Colo.) Consolidated Tramway Company displays in its cars a notice printed in black ink on a white card 5 in. by

#### NOTICE TO PASSENGERS.

1. Cars will stop at the further side of street in accordance to receive and discharge passengers.
2. Passengers are requested to enter and leave the car by the rear door, and on the side nearest the sidewalk.
3. In alighting take hold of the grab-handle, with FACE TOWARD THE FRONT.
4. All persons are warned not to attempt to enter or leave the car while it is in motion.
5. Persons riding upon the platforms or elsewhere on the car (than on the seats), do so at their own risk.
6. Never step from one car to another while they are in motion.
7. Smoking is allowed only on the two rear seats of open cars and on rear platform of closed car when not crowded and not pulling a trailer. Gentlemen are requested not to spit upon the floor.
8. Passengers are requested to carefully examine transfer tickets. They are issued only on the conditions printed thereon.
9. Inattention and carelessness on the part of employes should be promptly reported.

MAY 1, 1903

THE DENVER TRAMWAY COMPANY.

DENVER CONSOLIDATED TRAMWAY.

22½ in. The cut is reproduced from a copy sent us by Superintendent Durbin

D. S. Carll, chief engineer and superintendent of the Capital Traction Company, Washington, D. C., states that the company has a number of signs. On the rim of the hood is: "Warning: It is dangerous to ride on the platform." On the inside of the cars are: "Notice: Wait until the car stops; Will stop at Street crossings only."

"Warning: It is unlawful to expectorate in this car; Newsboys selling papers are not allowed on this car."

The sign as to expectorating is a police regulation and the company is obliged to carry this notice in the cars.

The Cleveland City Railway Company has but one rule posted in its cars; it relates to tobacco users spitting upon the floor of the car, and reads that any party so misusing the car shall be requested by the conductor to stop, and if he refuses the conductor is ordered to put him off the car.

The Toronto (Can.) Railway Company has notices posted which read as follows:

#### NOTICE

PASSENGERS RIDING ON PLATFORMS OR STEPS OF CARS  
DO SO AT THEIR OWN RISK.

PASSENGERS ARE WARNED NOT

1. To get on or off a car while it is in motion.
2. To lean on gates or screens on side of car.
3. To cross tracks behind cars without looking out for approaching cars

The Company will not entertain any claim arising from a disregard of the above warnings.

TRANSFERS must be made at the junction point for which the ticket is punched

FARES must be put only into the Fare Box.

In case of complaint, take conductor's number and report to Superintendent.

JAMES GUNN, Superintendent.

September 29th, 1898.

#### RATES OF FARES.

Cash Fares on Day Cars.....	5 Cents.
Cash Fares on Night Cars.....	10 Cents.
Children under 9 years of age, not in arms.....	Half Fare.

#### TICKETS.

Regular Tickets .....	.25 for \$1.00
Regular Tickets .....	6 for .25
Limited Tickets, good only between 5:30 and 8 a. m., and 5 and 6:30 p. m.....	.8 for .25
Limited tickets cannot be used on Sunday.	
School Children's tickets, good between 8 a. m. and 5 p. m., but not on Saturdays or Sundays.....	.10 for .25
Children entitled to ride on half-fare may use these tickets.	
Sunday. Special Tickets.....	7 for .25
(On other days Sunday Tickets are good only during hours of Limited tickets.)	

BICYCLES, CARRIED AT OWNER'S RISK, FOR ONE REGULAR FARE EACH WAY.

TICKETS WILL NOT BE ACCEPTED IN PAYMENT OF FARES ON NIGHT CARS.

Passengers are requested to see that their change and tickets are correct when received from the conductor.

JAMES GUNN, Superintendent.

August, 1897.

The Hot Springs (Ark.) Street Railroad Company places two signs inside the car, over the door at the end opposite the fare register. They are printed in plain type on a good quality of Bristol board and framed under glass with a neat half-round oak molding. Suitable warning cards are used on the open cars also. The notices for the inside of the car read:

"Notice: By order of the Board of Health, spitting on the floor of this car is positively forbidden. Hot Springs St. R. R. Co., C. G. Convers, Manager."

"Warning: Passengers are not allowed to stand on the platforms or steps, or get on or off while the car is in motion. All are cautioned about putting their heads out of car window. Hot Springs St. R. R. Co. C. G. Convers, Manager."

On each hood over the motorman's head, is this notice:

"Do not stand on the platform; step inside the car. Do not talk to Motorman. Wait until car stops."

Spitting on the floor gave the company a great deal of annoyance until three years ago, when the city council passed an ordinance making the penalty therefor a fine of from five to twenty-five dollars. Six men were arrested under the ordinance and fined \$5 each, which put an end to the nuisance.



Herbert Warren, general manager of the Duluth (Minn.) Street Railway Company, advises us that the company has but one printed sign in its cars, which reads as follows:

**FARE FIVE CENTS.**

Children free only when Under Five Years of age, not Occupying Seats and when accompanied by grown persons, but one such child will be carried free with each grown person. Full Fare will be charged for all others.

Parents and Guardians will be required to pay fare for all children who are of the Size and General Appearance of five year old children, regardless of actual ages, as conductors are forbidden to discuss the ages of children with parents and instructed to be guided entirely by size and general appearance.

The Metropolitan Railroad Company, of Washington, D. C., displays three signs in its cars. They are all printed in black, on white cards. No. 1 is on a card 18 in. long and 9 in. high,

## NOTICE.

Passengers are requested to observe the following Rules in boarding or leaving the Car.

**Do not get on or off while the Car is in motion.**

**On leaving the Car do not get off between tracks.**

When getting off, always step in the direction in which the Car is going.

**DO NOT STAND ON THE RUNNING-BOARD.**

WASHINGTON, D. C.—NO. 1.

trimmed as indicated to fit in a frame at the side of the door near the top of the car: it is printed on both sides and is visible

## WARNING!

### DO NOT EXPECTORATE IN THIS CAR.

Police Regulations, Sec. 35, Provides that it shall be unlawful for any person to expectorate or Spit on any part of a Street Railway Car.

Penalty: Fine not to exceed \$10 or 10 days imprisonment.

**THIS LAW WILL BE STRICTLY ENFORCED.**

## NOTICE

**PASSENGERS WISHING TO ALIGHT** are requested to press Electric Button or Signal Conductor **IMMEDIATELY** upon Car crossing the Street preceding that where they desire to get off—thus giving ample notice.

WASHINGTON, D. C.—NOS. 2 AND 3.

from the interior and from the platform. No. 2 is on a card 5½ in. wide and 12 in. long. No. 3 is 5½ in. wide and 13½ in. long.

The Los Angeles & Pasadena Electric Railway Company has had but one notice in its cars up to the present time; this is immediately over the controller and reads:

"The motorman is not allowed to converse with passengers."

The manager is of the opinion that other notices should be published in the car and now has the matter under consideration.

Israel A. Kelsey, general manager of the Winchester Avenue Railroad Company, New Haven, Conn., advises us that he has in his cars only such single line signs as "Do not get off or on

the cars while in motion," and "No Smoking." He believes that when signs are printed in small type they are not generally noticed.

The following companies to which we have written asking for copies of their rules as posted in the cars, state that they do not post rules in the cars:

- Lindell Railway Company, St. Louis.
  - Aurora Steel Railway Company, Aurora, Ill.
  - Terre Haute Electric Railway Company, Terre Haute, Ind.
  - Twin City Rapid Transit Company, Minneapolis and St. Paul, Minn.
  - Milwaukee, Racine & Kenosha Electric Railway, Racine, Wis.
  - Public Works Company, Bangor, Me.
  - Atlantic Coast Electric Railroad Company, Ashbury Park, N. J.
  - Oakland Railroad Company, Oakland, Cal.
- (To be continued.)

## ACCUMULATORS AT HANOVER.

Abstracted from a paper presented at the Geneva meeting of the Permanent International Tramway Union by Theodore Kruger, director, Hanover.

The accumulators are placed under the seats and comprise 202 elements in hard rubber cells, with a capacity of 25 ampere-hours at a discharge rate of 25 amperes. Each element consists of one positive Plante plate with an area of 13.17 sq. in., and two negative plates each of which has .66 lb. active material. The plates are separated by glass tubes or hard rubber strips. Below the plates is a space .16 in. in depth to allow the slime and disintegrated matter from the plates to collect. The plates are connected by lead strips. To prevent short circuiting the battery is mounted on a hard rubber trough, and air spaces are provided on all sides for cooling. To prevent noxious fumes entering the car the batteries are so ventilated that the forward motion of the car causes a current of air through the boxes and carries the gases off and upward. To prevent spilling the acid by reason of the jolting of the car, the cells are covered with soft rubber sheets, and a drain is provided to carry away any acid that may be spilled, so that it can not strike the truck or rails. The battery complete weighs, according to the state of the plates, from 4,400 to 5,500 lbs.

The batteries are at definite intervals subjected to a very simple but sufficient inspection. When the cars are brought into the car house at night the batteries are charged to the point of developing gas but care is taken not to sulphate the plates, and at the same time any damage that may have happened during the day is repaired. When charging, the loss due to evaporation is made good by adding the necessary amount of water; each day about one-third of the motor cars have water added to the batteries to make good the loss by evaporation. Each week the voltage of every element is taken and if found low the cause, which is usually a small short circuit, is removed. If at the next weekly inspection the element is still out of order, which, however, is seldom the case, it is cut out and thoroughly repaired, being replaced by a new one from a battery in reserve.

Also each week the battery is inspected as to the accumulation of sediment, acid density, polarization, breakage of tubes, cracking of cells, etc. Also the means of ventilating the cells and the acid drain pipe are looked after. This nightly work upon 70 cars is done at our Glocksee station by three men.

After running from 8,000 to 12,000 kilometers (5,000 to 7,500 miles), the distance varies on the different lines according to the demands made on the battery and the time during which it is charging from the trolley wire, the acid is pumped out, the glass tubes separating the plates removed and the sediment washed out. If the specific gravity of the battery fluid after this time is found reduced, chemically pure sulphuric acid is added to bring it up to 1.21 again. After the battery has been again charged a capacity test is made in order that it may be known whether it can be best used on a route requiring light or heavy service, until the next general cleaning. When the capacity has dropped to 12 ampere-hours, with a 25 ampere discharge rate, the battery is put in service on the light lines where only from 4 to 8 ampere-hours are needed and used until

It is to be again cleaned. At this cleaning the batteries are fitted with new plates. The positive plates that are yet fit for use are changed to older batteries, and those that cannot be used sold for the value of the lead.

The negative plates are freed from the old paste which has been reduced to metallic lead, and new paste provided. They are then as good as new and are again placed in cells. This "re-pasting" can be continued until the plate fails from mechanical causes.

The grid is made to last through six "re-pastings," or about 240,000 battery driven kilometers (150,000 miles.)

The cost of filling the negative plates with new paste is 76 marks (\$18.22) per car. The new positive plates cost 707 marks (\$169.55) per car.

From August 1, 1896, to August 1, 1898, the cost for maintenance and renewals of the batteries has been, in spite of unfavorable relations between the battery mileage and the trolley mileage, only 2.093 pf. per automobile kilometer (.81 cent per car-mile.)

The several routes are as follows:

	Trolley miles.	Accumulator miles.
1.....	6.87	2.47
2.....	2.60	1.55*
3.....	3.28	1.68
4.....	2.46	1.65
5.....	2.36	3.07*
6.....	1.36	1.06
7.....	2.40	1.82*
8.....	1.41	2.59*
9.....	.59	2.05*
10.....	—	10.93
11.....	.71	11.07
12.....	6.07	—
13.....	6.40	—
14.....	2.38	—

Those distances marked \* are covered twice, that is, one round trip, without recharging the battery.

The life of the batteries depends solely upon the treatment, and extent of the regular discharges. Aside from this the time of charging, upon which depends the strength of the charging current, is extremely important. With a positive plate of 85 sq. cm. area, such as used in Hanover, and charged with a current of 150 amperes for 10 minutes after a previous complete discharge, the longest life that could be expected is 20,000 automobile kilometers (12,400 car-miles). The negative plates under the same conditions would at best have a life of 18,000 automobile kilometers (11,178 miles), as they would not have the necessary capacity to carry the load at the full discharge rate.

If it is desired to increase the life of the battery, in fact nearly to double the life, it should be chosen large enough so that not more than one-half of its capacity will be needed, and care taken that the ratio of the charging time to the discharging time is at least as 1 to 2. If it be made longer the results will be better. It is believed that under these conditions a life of from 35,000 to 45,000 kilometers will always be obtained.

Notwithstanding that in the beginning the conditions were very unfavorable as to the time available for charging, the life of the batteries was 37,700 kilometers.

The average life of the batteries in 37 cars was 37,708 kilometers (23,417 miles).

The average life of the positive plates in seven cars was 39,497 kilometers (24,528 miles).

The average life of the negative plates in two cars was 37,554 kilometers (23,321 miles)

But favorable conditions as to the time of charging and discharging are of no avail if the inspection is not sufficient and above all if the cleaning (removal of sediment) is neglected. The current loss that usually occurs under these circumstances will ruin the whole battery in a short time; and when under favorable conditions the life of the batteries is short it is believed that the reason is lack of sufficient care.

The best demonstration of this is the fact that the life of stationary batteries is variously reported at from 1 to 12 years.

It has been definitely determined by measurements that the average charging current, for a discharged battery with a potential of 2.4 volts per element, is 36 amperes; when the batteries were charged the charging current was still about 1.7 amperes. A motor car weighing 10.5 tonnes (11.55 short tons), including the load, required, when taking current from the trolley wire, 554 watt-hours per kilometer (892 watt-hours per mile). When driven by the battery the same car required 533 watt-hours per kilometer (858 watt-hours per mile). The loss in charging the battery is taken to be 20 per cent more, making the total 640 watt-hours per kilometer (1,030 per mile). A car weighing 10.4 tons and drawing a trailer of 4.38 tonnes, a total of 14.78 tonnes (16.26 short tons) required 614 watt-hours per kilometer (989 per mile) by trolley, and 564 by battery traction; adding 20 per cent, makes the total for battery traction 676 per kilometer (1,088 watt-hours per mile). When the loss in the transmission from the generator to the car is included, the energy consumption per tonne-kilometer is at a high estimate not more than 70 watt-hours (102 watt-hours per ton-mile). The battery weighs say 2.5 tonnes (2.75 short tons), and to propel this weight requires 175 watt-hours per car-kilometer (280 watt-hours per car-mile). In Hanover, where the accumulators serve as regulators for the station as well as to propel the cars, the cost of energy (not including depreciation) is 1.2 cents per kilowatt-hour. (From this it would appear that the excess of cost of power for motor car-mile is about ½ cent when the batteries are in use, and 1-3 cent when not in use, over what the cost would be with a simple overhead trolley.—Ed.) What the conditions would be in other cities cannot be stated.

In the course of the next year numerous changes will be made which will increase the economy of operation. Arrangement will be made for the company itself to "re-paste" the plates, thus saving the manufacturer's profit and the freight charges. The acids will be made by the company reducing the cost 50 per cent. An automatic distilling apparatus is to be installed, dispensing with two men. The old plates will be cast into new ones and thus utilized to better advantage. There is produced annually some 20,000 kilograms of peroxide of lead, which will be purified and dried so that it will bring \$15 per 100 kilograms instead of only \$3, as heretofore. By substituting a benzine lamp for soldering, instead of using a hydrogen flame, which is possible by the use of a new composition, a considerable saving of time and money will be effected and equally good joints made.

## COMBINATION CABLE CARS.

In the REVIEW for July, last, at page 466, we illustrated a combination car built by the Third Avenue Railroad Company, of New York, from two old car bodies, a grip car and a closed trailer. This car was designed to comply with the rule of the board of health which requires that a number of closed cars be run on all lines even in warm weather. This plan has, we understand, given good satisfaction, and the car is a particularly acceptable one because there is no jerking and bumping as was the case when the grip and trailer were separate cars.

In view of this action it is of interest to note that there is another side to the question of whether long cars for city cable lines are the best practice. The North Chicago Railroad Company has just completed the transformation of 90 34-ft. combination open and closed grip cars, cutting them apart and making a closed trailer 26 ft. 6 in. long, including the new platform, and an open grip car 12 ft. 6 in. The cars have been in service a long time, and while the management has wished to make the change before, it waited until the present season, when the trucks had to be renewed, to make it.

The Suburban Railroad Company, of Chicago, has what is stated to be the largest sprinkling car ever built for street railway service. It was made at the shops of the West Chicago Street Railroad after plans of Master Mechanic Bridges, and is a cylindrical tank of 5,000 gallons capacity. The West Chicago controls the Suburban road.



## POWER CONSUMPTION ON ELECTRIC RAILROADS.

From a paper by S. T. Dodd, read before the Civil Engineers' Club of Cleveland and published in the Journal of the Association of Engineering Societies.

About 10 years ago I saw for the first time an electric street car propelled by the power of 40 horses. To my mind, acquainted only with ordinary two-horse traction, a double 20-h. p. equipment seemed out of all proportion to the speed and size of the car.

Our ideas on such subjects have changed since those days, and today no one would think of using less than a double 25-h. p. equipment for street railway work; while double and quadruple 25, 50 and even 75-h. p. equipments are so familiar that they pass through our streets without comment.

I suppose no one would expect to operate a 20-ton car at a speed of 30 miles per hour with the current it takes to run an arc lamp, yet such a mistake would be no more glaring than some that have been made in the development of electric traction. What I now propose is to make an analysis of the losses occurring in electric railway operation and to show that the power of our equipments is no greater than might be expected from the ordinary laws of mechanics, from the weights we are propelling and the speeds, acceleration and grades which we encounter.

The power necessary for propelling a car or train depends upon two quantities—(1) the speed, which is a definite, measurable and easily recognized quantity; and (2) the force, the effort exerted by the motive mechanism, or its equivalent, the train resistance. This latter, being more obscure and less easily measured, deserves a careful study.

In analyzing train resistance, four principal divisions must be noted:

1. Grade resistance, or the effort necessary to lift a train up a certain slope. In electric railroad work this becomes a more important factor than in steam railroad work, on account of the steeper grades encountered.
2. Curve resistance, or the effort necessary to propel the cars around curves upon the track. This enters as so small a factor that I shall note it here only for the purpose of completeness, and shall not refer to it again.
3. Acceleration resistance, or the effort necessary to impart to a car of given weight a certain velocity in a certain time. On account of the character of the traffic, this becomes a more important factor in electric railroad work than it is in steam railroad work.
4. Frictional resistance, or the effort necessary to propel a train at a constant velocity over a level track. This division, being the most obscure, shall receive our attention first.

### FRICTIONAL RESISTANCE.

The nature of the resistance encountered by moving trains has been discussed by steam railroad engineers for many years. In electric railroad work we have an advantage over steam railroad engineers in the measurement of this quantity. In steam railroad work readings from a dynamometer interposed between the engine and train give only the resistance of the train itself, leaving out of account the resistances experienced by the engine, which in many cases amount to a very considerable proportion of the whole. While the reading of steam engine indicators is a sufficiently laborious and delicate operation on stationary engines, it is much more so when the position of the observer is on the outside of a locomotive running at 25 to 60 miles an hour; and, even with this indicator reading, unless the efficiency of the engine is very accurately known, as it seldom is, we are unable to separate the train resistance from the internal losses in the engine. On the other hand, the determination of train resistance in electric railway work is a very simple matter.

Fig. 1 represents the curves of torque and speed of a street railway motor. These curves can generally be obtained from the manufacturer of the motor, or, if necessary, their independent determination is a very simple matter. The vertical ordinate of any point on either curve represents the current flowing into the motor, while the horizontal distance from the left-hand side of the sheet shows upon one curve the speed in miles per hour at a

fixed voltage, and upon the other curve the horizontal effort in pounds which the motor will exert at the tread of the driving wheels when it is taking this amount of current. In order to determine the effort exerted by a car equipment it is necessary only to place an ammeter in circuit with the motors, and the reading of this, by comparison with the curves of the particular motor, gives us immediately the horizontal effort exerted by the motor at that instant, and approximately the speed. For example, supposing the motor in question to be geared with 24 teeth in the pinion and 58 teeth in the axle gear; the two curves marked "Gearing 58-24" in Fig. 1 show that when 30 amperes are flowing into the motor it will exert a horizontal force, at the rim of 33-in. driving wheels, of 120 lbs., and the car will be moving at 42 miles per hour with 500 volts at the motor terminals. If the ammeter reading is 125 amperes, the same curves show that the effort exerted is 1320 lbs. and the speed is 18½ miles per hour. I say "approximately the speed" because the speed is dependent upon and almost proportional to the voltage at the motor terminals, and, as this fluctuates in electric railway work anywhere from 10 to 20 per cent, the speed cannot be determined without a simultaneous determination of the voltage. The torque exerted by the motors, however, is independent of the voltage; a certain current flowing through the coils of the motor will develop a definite pull at the armature shaft. I am aware that this statement contradicts a popular impression that a series-wound motor requires more current to drive a car at a low than at a high voltage, but it can be shown that the statement is absolutely true and that the popular impression is the result of mistaken, or rather misinterpreted, observations.

To return, however, to the question with which we started: How many pounds of pull does it take to move a train of a certain weight at a certain velocity? The formulæ which steam railroad engineers have developed have been in some cases based on hundreds of experiments, but, on account of the widely differing nature of track and train construction, the formulæ differ widely from each other, both in their form and in their final results; and, without intending to criticize the older branch of railroad engineering, I wish to collect here some of the best known of these formulæ and compare them with readings which we have obtained in electric railroad work.

1. One of the oldest formulæ with which I am familiar was proposed by D. K. Clark, and is of the form  $F=(S+V^2+178)W$ ,  $V$  being the speed of train in miles per hour and  $W$  the weight of train in tons of 2000 lbs.

2. Another formulæ, proposed by Professor Rankine, is of the form  $F=[5.35+268(V-10)](T+2E)$ .  $T$  is the weight of the train behind the engine and  $E$  the weight of the engine and tender. Rankine's formula is that of a straight line, the resistance being proportional to the velocity above 10 miles per hour and a constant quantity below that. He also recognizes the importance of the head resistance, the "pace-making" effort of the engine.

3. A formula proposed by W. H. Searles, and based on his experiments, and which, Mr. Wellington says, has a "wonderful range of application to all speeds, conditions and classes of trains," is of the form  $F=4.82 W+.00535 V^2 W+.0004783 V^2 E^2$ .

4. The most complete and accurate experiments with which I am familiar were made by A. M. Wellington, who divides the resistance of a moving train into:

- a. Rolling friction, or the friction of the journals and that between wheel and rail, a quantity independent of the speed.
- b. Head resistance, or the atmospheric resistance experienced by the first car of the train.
- c. Side resistance, or the resistance offered by the atmosphere to the several cars of the train.
- d. Oscillating resistance, or increased journal and rolling friction, depending on the speed.

The formula he develops takes account of all these, and is of the form  $F=4 W+.26 V^2+.03 V^2 G+.005 V^2 W$ ;  $G$  in this formula representing the number of cars in the train.

For sake of comparison I have collected in the table below the results of about twenty observations, which I consider the most trustworthy of those I have been able to get. These observations have all been made on interurban cars running on T rails and over a level track at a uniform speed.

## TRAIN RESISTANCE.

### COMPARISON OF OBSERVATION AND FORMULÆ.

No. of Cars,	Speed of Tram,	Weight in Tons,	Res. per Ton,	Clark,	Rankine,	Searles,	Wellington,	
1	25.0	20	23.5	11.7	18.	14.8	17.7	23.2
1	28.	21	22.	12.4	20.3	10.8	19.5	23.6
1	32.	20	25.	13.8	22.5	19.8	25.	24.4
1	34.	21	25.7	14.4	23.5	22.6	26.8	24.8
1	36.	21	28.3	15.2	24.7	24.8	29.5	25.2
1	43.	20	27.	18.3	28.4	32.4	42.	26.6
1	45.5	20	27.7	19.6	29.6	35.4	46.	27.
1	47.	20	28.	20.3	30.5	37.8	49.	27.4
1	47.5	20	27.3	20.6	30.75	38.5	50.	27.5
1	49.5	20	25.	21.7	35.9	41.4	54.	27.9
2	27.	35	17.7	12.1	15.5	12.7	14.7	18.7
2	39.	35	20.3	16.5	20.5	21.5	25.5	21.1
2	40.	35	25.	17.	21.	22.	27.6	21.3
2	40.25	35	20.25	17.1	21.2	22.3	27.8	21.3
2	42.25	35	22.3	18.	22.	24.1	30.7	21.8
3	25.	50	16.	11.5	13.1	10.5	11.7	16.4
3	34.5	50	20.	14.6	16.7	15.7	18.8	18.3
3	37.6	50	18.5	15.9	17.9	17.7	21.5	18.9
6	31.8	95	18.3	13.7	11.2	12.35	14	15.7

$$\text{Clark } \left( 8 \times \frac{V^2}{178} \right) \times W.$$

$$\text{Rankine } \left\{ 5.35 + .27 (V-10) \right\} (T + 2 E).$$

$$\text{Searles } 4.82 W + .005357 V^2 W + .0004783 V^2 E.$$

$$\text{Wellington } 4 W + .28 V^2 + .03 V^2 C + .005 V^2 W$$

$$\text{Proposed } (18 + .2 V) E + (7 + .2 V) T.$$

V=Speed in miles per hour.

C=Number of cars in train.

E=Weight of engine or motor car in tons of 2000 pounds.

T=Weight of trailer cars in tons of 2000 pounds.

W=Weight of whole train E + T.

In this table the first column gives the number of cars composing the train, the second the total weight of the train, the third the speed in miles per hour and the fourth the traction coefficient or horizontal effort in pounds per ton of train, as calculated from the current consumption. The succeeding columns give the results of the formulæ which I have already quoted, applied to these particular cases. The formulæ themselves are repeated at the foot of the table.

It will be noticed that the formula of Mr. Clark is too low in every case to correspond to these observations. The common fault of the other three formulæ is that the velocity plays too important a part in them. At speeds in the neighborhood of 50 miles per hour their results are too high, and at 25 miles per hour they are too low. This is particularly the case with the formula of Mr. Searles and Mr. Wellington, where the velocity enters as the square.

I do not propose to base a formula on the results of about 20 experiments; but, as I have said, these observations are the most trustworthy that I have been able to collect, and it may be of interest to try to find a formula which shall combine their results more nearly than those which have already been proposed. By plotting these results I have decided on the following formula as expressing, as nearly as possible, the results of these observations.

For a single-motor car weighing E tons, pulling trailers weighing T tons, the resistance in pounds due to the motor car is  $(18+.2 V) E$ , and that due to the trailers is  $(7+.2 V) T$ . The results of this formula have been worked out in the last column, and, by comparing them with the observations in column 4, they will be seen to give a very fair agreement.

As far as my own observations go, for ordinary interurban cars running on straight and level T rails, with roadbed of modern construction, the formula

$$P=(18+.2 V) E+(7+.2 V) T$$

expresses very fairly the train resistance between 25 and 50 miles an hour, and, while I do not mean to say that these experiments are exhaustive, I hope this statement may be of assistance to other observers in collecting and stating the results of their observations.

### ACCELERATION.

The next question which demands our attention is the power expended in acceleration. How many pounds of pull does it take to give a certain weight a certain velocity in a fixed time? What

accelerations are usually attained in practice, and what are the attainable and limiting rates of acceleration?

The answer to the first of these questions is mathematical rather than experimental. If a force P acts upon a mass W to produce acceleration, leaving out of account for the present the force necessary to overcome friction, the acceleration, F, will be equal to  $32.2 \times P \div W$ ; forces and weights being expressed in pounds and acceleration in feet per second per second. In what follows it will be convenient to express acceleration in terms of the gain in one second of velocity measured in miles per hour, which we will write F';  $F=F' \times 5280 \div 3600$ .

Transforming the equation above we get  $P=F' \times W \div 219$  and if  $W=2,000$  lbs., we get the force per ton equal to the acceleration multiplied by 91.3, or pounds per ton= $F' \times 91.3$ .

The curves in Fig. 2 show the accelerations which are obtained in actual practice. Curve No. 1 shows a start of an eleven-car train on the Chicago, Burlington & Quincy Railroad, copied from data given by Wm. Forsyth in a published article.

Curve No. 2 shows the start of a Manhattan Elevated train. Curve No. 3 shows the start of an Akron, Bedford & Cleveland

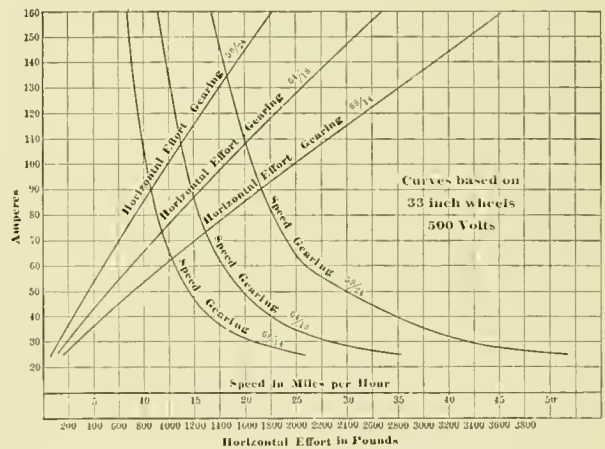


FIG. 1. RAILWAY MOTOR. SPEED AND TORQUE CURVES.

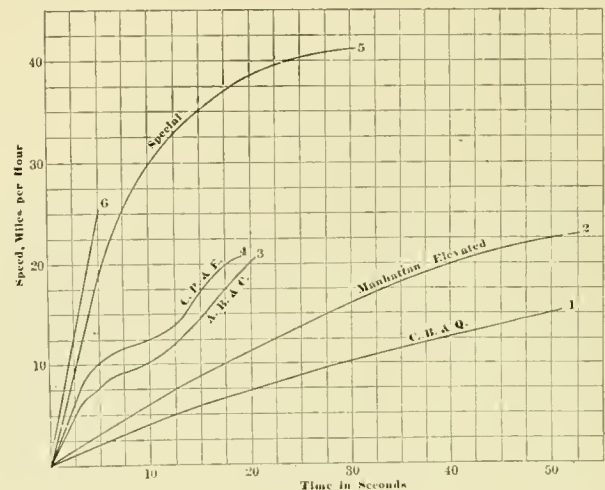


FIG. 2. ACCELERATION OF TRAINS.

Car. Curve No. 4 is a corresponding observation made on the Cleveland, Painesville & Eastern road.

Curve No. 5 shows the starting curve of a car equipped with a view to experimenting upon very high accelerations.

The following table shows the number of pounds per ton used for acceleration in the various starts shown in these curves, calculated from the acceleration by the formula derived above:



## HORIZONTAL EFFORT. FOR VARIOUS ACCELERATIONS AND GRADES.

Roads.	A.	G.	H. E. per Ton.
C. B. & Q., steam.....	1		36.5
Manhattan Elevated, steam.....	2		55
A. B. & C., electric.....	3		183
C. P. & E., electric.....	4		238
Special.....	5		348
Limit.....			470
Woodland Avenue.....		9%	180
Seneca Street.....		11%	220
North Hill.....		13½%	270

The limit of possible acceleration in railroad work is naturally fixed by the slipping of the driving wheels. It can be shown that the start represented in curve No. 5 is very near to this limit. It is generally acknowledged that the adhesion of wheels to rails is, under good conditions, one-fourth of the weight upon them, and under ordinary conditions one-fifth. If we assume, however, one-fourth, and assume moreover, that the whole weight of the car rests upon the driving wheels, it will be seen that the limiting accelerating force is about 500 pounds per ton, and, allowing 30 pounds per ton for frictional resistance, we have about 470 pounds as the limiting acceleration. Curve No. 6 shows this limit. That such starts as this are not uncomfortable, if made smoothly, is testified to by the fact that we experience negative accelerations of comparable amounts upon our interurban cars without discomfort. I have myself noted a stop from 25 miles per hour within 90 ft., and from 41 miles per hour I have seen a stop made in eight seconds. As these represent a negative acceleration of 475 pounds per ton, it is evident that the rails were in pretty good condition, and that we had an adhesion of about one-fourth. I might note that both these were emergency stops, and a little more sudden than ordinary. I am told by motormen upon our suburban roads that, with brakes in good condition, they can always make a stop from 50 miles per hour in five poles or 450 ft., which represents a negative acceleration of 365 lbs. per ton.

From these facts we may conclude that the limit of possible acceleration is fixed only by the adhesion of the wheels to the rail, or by the willingness of railway managers to provide extra power for the sake of increased schedule speeds.

### GRADE RESISTANCE.

It is often stated, as an advantage of electric traction, that an electric car is able to mount steeper grades than a steam-driven train. This statement, while true, is often misstated, or rather misunderstood, by those who make it. The advantage does not lie, as many seem to think, in the electric current per se, and when steam railroad managers think it advisable to equip an 800-ton train with 8000 h. p. in motive power the difference will not be as apparent as it is today. The force necessary to lift a train up a grade is the same fraction of the weight of the train that the rise of grade is of the horizontal length.

As an example of some of the grades we meet in practice, we may note that the Cleveland City Railway is operating on Woodland Avenue a grade of 9 per cent, and pulling trailers on that. The Cleveland Electric Railway is operating on Seneca Street Hill a grade of about 11 per cent; the A. B. & C. is operating on North Hill, Akron, a grade of 13½ per cent. To compare these resistances with those ordinarily experienced in acceleration, the latter part of the table shows the number of pounds traction per ton of train necessary to mount such grades.

An inspection of the table shows that the tractive effort necessary on ordinary grades is comparable with that necessary for such acceleration as we ordinarily meet in electric railroad practice.

### POWER CONSUMPTION.

Let us apply the data of the foregoing discussion to some problems, in order to determine the power expended in particular cases.

Let us take, as a first illustration, an ordinary city car, which, together with the equipment, will weigh about 12 tons. As may be noted any night after 12 o'clock, going out either Prospect Street or Detroit Street, the maximum speed which such cars attain on a level, after the period of acceleration is past, is about

20 miles per hour. Applying our formula for train resistance,  $18+2V$ , the frictional resistance of such a car at this speed is about 22 lbs. per ton, giving us a horizontal effort of 264 lbs. necessary to propel a 12-ton car; and 264 lbs., at 20 miles per hour, is equal to 14 h. p. Assuming that the efficiency of such motors as are ordinarily used at this speed is about 75 per cent, this gives an input at the trolley of 18.8 h. p. or 14 k. w., which, at 500 volts, is equivalent to 28 amperes. This represents approximately the amount of current necessary to propel such a car.

As a second illustration let us consider an ordinary double-truck interurban car. The weight of car body and truck, empty, is about 15 tons. The motors ordinarily used for such a car weigh about 3,000 lbs. We can estimate the total weight, including a two-motor equipment and a few passengers, at about 20 tons. These cars run upon a level at a speed of about 28 miles per hour. Applying our formula, we get 23.4 lbs. per ton, or a total of 472 lbs. horizontal effort necessary for propulsion. At 28 miles an hour this is equivalent to 35 h. p. Figuring the efficiency of these larger motors at 82 per cent gives us 43 h. p., or 32 kilowatts input, which, at 500 volts, gives 64 amperes, or 32 amperes per motor, as the ordinary running current.

Another interesting question is, What should the starting current amount to in cars of this weight? If we take curve 3, Fig. 2, the curve of acceleration for the A. B. C. car, we see that, at the maximum, as the acceleration begins to fall off (which corresponds to the point where the controller is entirely cut out), we have an acceleration amounting to 1.25 miles per hour per second. This is equivalent to 114.5 lbs. per ton, or, for a 20-ton car, about 2,300 lbs. horizontal effort necessary at this point. As the speed attained with this pull is approximately 18 miles per hour, the motors are delivering about 110 h. p. Figuring the efficiency of the motors at 80 per cent, we get a total input of 138 h. p., or 103 k. w., which, at 500 volts, represents 206 amperes as the starting current.

As a final example, let us consider the cars of our latest interurban road, the Lorain & Cleveland Railroad. No tests on this road have as yet been published, but we are promised by the engineers a complete set of tests as soon as the road is in running shape. When such tests are published we shall have some basis for judging of the reliability of the figures above submitted. Such cars will weigh, empty, about 15 tons, or 30,000 lbs. They are equipped with four motors, which must weigh in the neighborhood of 3,000 pounds each. We can safely estimate the weight of car and equipment at 22 tons. With these cars a speed of 35 to 45 miles an hour is common, and after having gone a mile or so from a stop they attain a speed of 50 miles per hour.

The train resistance on a level is  $(18+2V)W$ , and since, in the present case,  $W$  is 22 tons and  $V$  is 50 miles, we have 616 lbs. effort necessary for propulsion. Now, 616 lbs. at 50 miles per hour is equivalent to 82 h. p., which represents the output of the motors at full speed. For motors of this size we may estimate the efficiency at about 82 per cent. This means 100 h. p. input to the motors.

As for voltage, a visit to the power house will show that a voltage of about 600 is carried, and that heavy feeders are used. We can, therefore, estimate that they get 550 volts at the motor terminals. One hundred horse-power at 550 volts is 135 amperes. My estimate, based on the data given, is that it takes about 135 amperes to propel these cars after they have attained full speed.

Another interesting question is, How much current does it take to start these cars? If we are allowed to make some assumption, we can estimate somewhat nearly. These cars seem to me to gain speed at the start a little more slowly than do our ordinary suburban cars. Let us suppose that they start under an accelerating force of 150 lbs. per ton, or a total effort of 3300 lbs. To this must be added about 23 lbs. per ton for frictional resistance, making a total of 3500 lbs.

How much current, flowing through these motors, will produce a horizontal effort of 950 lbs. per motor? To determine that it will be necessary to know of what speed the motors are capable at some definite voltage and at this torque. From the car windows we may note that a speed of 35 or 40 miles is very soon attained, but it is not until after we have traveled a mile or so that we reach a speed of 50 miles per hour. We will not be far from cor-

rect if we figure that the motor maintains an accelerating force of 150 lbs. per ton up to about 25 mi. per hour, and that then, as the controller is entirely cut out, the motors continue to speed up and the current falls off, together with the acceleration. An effort of 3800 lbs. at 25 miles per hour is equivalent to 254 h. p. Assuming again the efficiency of the motors at 80 per cent, we get an input of 317 h. p., or 236 k. w. At 550 volts this indicates a current of 430 amperes as the probable current during the period of acceleration.

In conclusion, let me repeat the statement I made in the beginning. It often seems that the equipment of a single car with motors of from 100 or 200 h. p. is an unnecessary waste of power, but when we consider the weight of car and the loads under which we are operating, the rapidity with which we are compelled to accelerate these weights on account of our frequent stops and the grades which our ordinary highways compel us to climb, we see that ordinary mechanical principles justify the demands of practice for heavy equipments.

In the course of discussion, W. H. Searles said: The constants appear to be too high, and the line of the formula not sufficiently inclined. At five miles per hour, at which the resistance of a passenger car is known to be a minimum of not over 4 or 5 lbs. per ton, the formula gives  $(7+1) T=8 T$ , or 8 lbs. per ton; and for the motor it gives 19 lbs. per ton. We need experiments on a greater range of velocities, all the way from 5 to 60 miles per hour before building a formula for motor cars; but it would seem that if the present formula were written thus:

$$P=(14+.3V)E + (3+.3V)T.$$

it would better meet the general conditions, while agreeing equally well with the few instances cited in the paper. It is hardly possible, however, for a right line formula to represent all the facts. There should be, in my opinion, at least one term involving the square of the velocity.

## ELECTRIC CANAL HAULAGE.

The following abstract of a paper on this subject read by A. H. Allen before Section G (Mechanical Science) of the British Association for the Advancement of Science, we take from "Engineering," of London:

The author commenced by giving some interesting historic details as to the once-flourishing condition of canal traffic and its subsequent decay, contrasting the present deplorable condition of canal working with the prosperity of German, French, and Belgian systems. One among the many reasons assigned for this state of affairs is the inefficiency and high cost of horse haulage. To get over these defects Messrs. Thwaite and Cawley had designed the system described, and which is to be tested on one of the great northern canals. Previous attempts towards applying electric traction for canals have generally been in the direction of supplying current through overhead wires along the banks, the motors being on the barges and working screw propellers, or, in one case, an aerial propeller. A length of 3 miles on the Burgundy Canal is operated electrically by means of a chain laid along the bed of the waterway. The tug carries the motor which winds the chain on to a drum attached, current being received from an overhead wire and returning to earth by the chain. The difficulty of passing when one tug with its train of barges meets another is, in the author's opinion, a fatal bar to the general adoption of this system. In the arrangement described in the paper an aerial railway is provided, consisting of two steel rails of channel or Z-section, and braced together at one side, so as to form a rigid girder. This is supported at a height of 9 ft. or 10 ft. above the towing-path by posts, and each of the rails forms a running track for a number of electric locomotives which form the towing instrument and take the place of the horse in ordinary work. These locomotives, having no load to carry, may naturally be of comparatively small size, so that the term "locomotive," as generally understood, hardly conveys a fair idea of the apparatus. It consists simply of an electric motor mounted on a four-wheeled carriage. Two other wheels run upon the upper surface of the rail and support the

weight of the locomotive, while two run underneath the rail, bearing against the lower surface in such a way as to insure the stability of the locomotive. Two horizontal rollers are pressed by springs against the edge of the rail in order to guide the carriage in the correct running position. The locomotive is thus locked to the rail and is securely held in position by its own weight. By giving suitable proportions to the relative lengths of the axles of the wheels the total pressure between the wheels of the rails can, by leverage, be made as great as may be desired, far greater than the weight of the locomotive itself. All the wheels are made drivers, worm gearing being used. The motor is of an ordinary type. The author's calculations show that the tractive force needed for towing a barge carrying 100 tons at the rate of  $2\frac{1}{2}$  miles per hour is from 250 lb. to 300 lb. The maximum brake horse power at this speed is no more than two, but in order to get up speed quickly at starting the motor must be designed to give a tractive force of about 600 lb. for a short time. Such a motor would weigh about 300 lbs., and the weight of the motor and carriage would not exceed 900 lbs. For a speed of 4 miles an hour the tractive force should be 750 lbs., or 1,200 lbs. at starting. The weight of the motor would then be 600 lb., and of the motor and carriage about 1,400 lbs. The electrical conductor would be bolted to the lower side of each rail, and current is collected by an insulated brush and return path, being through the rails at low resistance.

Provision has to be made for allowing the tow ropes from the locomotives to the barges to clear each other when two craft meet. This is effected naturally, as the two rails form an up and a down line, being in the same vertical plane. When two barges meet, the one which is being towed by the locomotive running on the lower rail steers close to the towpath side, the other sheering out, and no delay or obstruction is thus caused. The author rightly attaches importance to this observation, having shown that about one-fifth of the whole time occupied is lost in passing ropes on a busy canal. The whole apparatus is controlled from the barge by simple means, and naturally no alteration has to be made in the vessels themselves, whilst horse and electrical towage may be carried on simultaneously on the same canal. It is estimated that the cost per ton-mile would be 0.032d. by this system, as compared to 0.77d. by horses, the speed being  $2\frac{1}{2}$  miles per hour. The loss of time due to passing with horse traffic would make the time occupied 15 hours, as compared to 12 hours for electric traction. The cost of the latter at 4 miles per hour would be 0.041d. per ton-mile. Details of expenditure to make up these figures were given in an appendix.

A brief discussion followed, in the course of which Forster Brown pointed out the advantage of developing canal traffic in establishing competition with railways.

## THE WAY THEY DO IN JAPAN.

A correspondent writing from Japan tells of a novel method of determining the compensation of employes which has been adopted by the street railway at Tokio.

It is regulated by rules of the company that compensations of a driver and conductor are to be determined by the receipts of the car they were assigned. The rate thus allowed to a driver or conductor is 4 per cent of the gross earnings, or 4 cents on every dollar. Daily earning of an employe thus determined is entered in a book of the company, and at the end of every month it is paid out minus 23 cents as a monthly charge for the uniformed hat and clothes lent by the company to each of its employes.

The West Chicago Street Railroad Company has placed an order for 40 car bodies to replace an equal number which have been worn out in service. The cars will be 31 ft. over all with 4 ft. 6 in. platforms at each end. The interior will be finished in white ash with cherry trimmings and the ceilings will be of white birch. The Brill trucks used under the old car bodies are still in good working condition and will be placed under the new cars.



**ELECTROLYTIC CORROSION OF WATER AND GAS PIPES BY THE RETURN CURRENTS OF ELECTRIC TRAMWAYS.**

Dr. J. A. Fleming before the British Association, September, 1898, discussed this subject and we reprint a portion of his paper.

The subject of pipe corrosion by the earth return electric currents of electric tramways has at various times attracted a considerable amount of attention. There is no need to refer to the experience gained in the early days of electric traction, chiefly in the United States, which impressed on engineers the necessity for proper and efficient bonding of the rails in those cases in which they act as the return circuit. The British Board of Trade regulations now in force, under which electric traction is at present conducted in the United Kingdom, prescribe precisely the conditions for the use of uninsulated metallic return circuits, which are intended to prevent injurious electrolytic action on subterranean pipes. Amongst these rules an important one is the sixth regulation, in which the maximum permissible potential difference which may exist between a pipe and a portion of the neighboring rail return is stated. In the case of an overhead electric tramway working with an earth return in which the current returns to the generating station by the bonded rails, assisted or not by return feeders, an electrical survey, made, when cars are running, by measuring with a voltmeter the potential difference between the rails and any pipes buried in the earth in the neighborhood, generally will reveal certain districts over which the tram line rails are positive to the buried pipes in their neighborhood, that is, are at a higher potential. Certain other regions, usually near the generating station, will be discovered, in which, on the other hand, the pipes are positive to the rails. The Board of Trade regulation 6 is as follows:

"If at any time and at any place a test be made by connecting a galvanometer or other current indicator to the uninsulated return and to any pipe in its vicinity, it shall always be possible to reverse the direction of any current indicated by interposing a battery of three Leclanchè cells connected in series if the direction of the current is from the return to the pipe, or by interposing one Leclanchè cell if the direction of the current is from the pipe to the return."

The above translated out of official language signifies that if the pipe is negative to the rail the potential difference shall not exceed 4.5 volts, and if the pipe is positive to the rail the potential difference shall not exceed 1.5 volts.

No matter what difference of potential may exist between a pipe and the neighboring rail it is well understood that electrolytic corrosion or damage can only ensue at any place under two conditions:

1. The potential difference must create an electric current which leaves the pipe at that place; and
2. The conduction through the surrounding soil, or at least into it, which thus takes place must be electrolytic in character.

Hence, generally speaking, the danger areas are those in which the pipes are positive to the rails, and where a resulting current flows out of the pipe into adjacent electrolysable soil. Assuming then that the Board of Trade regulations are obeyed, the chief question of practical interest at present is to determine whether under normal conditions of working a potential difference of less than 1.5 volts between a pipe and the nearest part of an earth return, the pipe being positive to the return rail, is sufficient to cause an injurious action on the pipe by the production of electrolytic erosion. The matter is certainly largely determined by the nature and amount of the electrical conduction which can take place through ordinary soils, specially those which form the sub-soil in towns and cities. Information has therefore been collected on this matter.

It has been frequently stated that concrete is a very bad conductor or fair insulator, and that rails laid on it are practically insulated, but the considerable decrease which takes place in the electrical resistance of materials such as clay, cement, concrete, sand and various soils, when impregnated with moisture, and the great increase which takes place when they are arti-

ficially dried, indicates that the conduction through them in their normal condition is largely due to the presence of water, and must, therefore, in great part at least, be electrolytic in character.

In the average condition of moisture most of the materials forming the sub-soil in town and city streets are not likely to differ much in conductivity from the sample of London clay, damp sand or cement and will probably have a specific resistance between 15 and 30 ohms per cu. yd. Although the above specific resistance is large compared with that of metals, being of the order of 1,000 million times that of copper, yet between extensive metallic surfaces buried in the soil, the actual total electrical resistance may be numerically very small. Between two 100 yd. lengths of 6-in. clean iron pipe, placed in clay ground a yard apart, and, say, 2 ft. deep, the actual measured resistance would in general be something of the order of 1 ohm. It is clear, therefore, that a continuously applied voltage, not exceeding 1.5 volts may cause the flow of very considerable quantities of electricity in the course of time between metallic surfaces of large area buried in the soil. Moreover, it is evident that a not inconsiderable portion, and perhaps the whole, of this flow, must be carried by electrolytic conduction. In any case, whatever may be the nature of the actual roadbed on which the rails rest, the conduction out of the pipe will be in part electrolytic, if the pipe itself is in contact with ordinary soil. Under these circumstances the anode or pipe will be electrolytically attacked. Suppose that two iron plates or surfaces are placed in sand moistened with water, and having in it electrolysable salts, the acid radicles of which

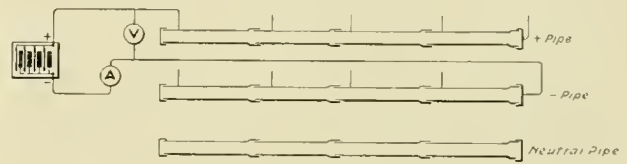


FIG. 1.

can attack iron. Let a current be made to flow from one plate to the other by creating a potential difference between them, then the passage of one ampere-hour out of the positive plate will remove or dissolve off from that plate 0.6968, or, say, 0.7 of a gramme of iron, if the metal is removed in the ferric state, or 1.04 grammes if in the ferrous state. Since there are 453.59 grammes in one pound (avoirdupois), and since the specific gravity of iron is about 7.8, it is easy to see that one cu. in. of iron may be removed from the positive plate by the electrolytic passage out of it of some electric quantity between 127.7 and 182.5 ampere-hours. This is, very roughly speaking, one ampere-week. The iron so electrolytically removed may pass either into soluble iron salts, or may remain as an adherent layer of hydroxide. If chlorides, sulphates or nitrates are present in the soil, the iron may be removed partly as ferrous or ferric salts which may be diffused through the surrounding soil, or wholly or in part converted into insoluble and adherent ferric hydroxide by secondary reactions.

Experiments show that quite small potential differences—less than 1 volt—between iron surfaces buried in damp soils, especially if soluble chlorides are present, may bring about considerable electrolytic erosion in not very great periods of time, and that there is no absolute security in the limit of 1½ volts as imposed by the Board of Trade regulation. It was felt desirable to try an experiment on a somewhat larger scale and with actual water pipes buried in the soil.

Three rows of cast iron 5-in. water pipe, (Fig. 1), were laid down in the ground, one yard apart. Each row consisted of four lengths of pipe, 36 ft. in all. The lengths were jointed in the usual way with lead and the ends of the lengths were capped with cast iron caps. In each pipe length was screwed a wrought iron rod about 2 ft. 6 in. in length.

These 36-ft. lengths of pipe were buried in the ground 2 ft. deep, just as if they were actual water pipes in use. The ends of the iron standards projected above the ground, and enabled an electrical connection to be made with the pipes at any length.

The pipes when buried were clean, new cast-iron pipes. Arrangements were then made to keep two adjacent rows of these pipes at a difference of potential of one volt night and day for six months. This was achieved by the use of a couple of large storage cells charged alternately, and which were connected through an adjustable resistance with the two adjacent rows of pipes. A low reading ammeter and voltmeter were provided. The experiment was started on March 1, 1898, and continued for six months. Daily readings were taken of the voltage between the pipes, the current passing between the pipes, and the nature of the weather.

One row of pipes was neutral and simply laid down for comparison to observe the normal appearance of the pipes at the conclusion of the experiment. The other pair of pipes had a difference of electrical potential of one volt maintained between them constantly. All three rows of pipes were otherwise under similar conditions and buried in soil of the same kind, a non-acid nearly neutral loam or sandy clay. The average current passing between the two active pipes was .15 ampere, and varied only between .1 and .2 ampere during the whole six months. At the end of the six months the pipes were opened up and carefully examined. The appearance of the pipes were very different. That pipe length which had been connected to the negative pole of the cell was a clean, grey color and had scarcely any trace of oxidation on it. It closely resembled the appearance of the pipe when first put in. The pipe length which had been connected to the positive pole of the cell was uniformly covered with a layer of orange-yellow oxide or hydroxide of iron, in some places of quite sensible thickness and easily detached. The pipe which had been neutral was oxidised slightly in places, but by no means uniformly. The experiment lasted 4,416 hours and 662 ampere-hours had passed from one pipe to the other under a constant voltage difference of one volt. The appearance of the pipes clearly indicated that electrolytic action had taken place. In the case of the negative pipe the clean appearance suggested that electrolytic hydrogen had been liberated against it and preserved it from oxidation by contact with the gases, water and salts in the soil. In the case of the positive pipe electrolytic action had clearly assisted or created oxidation. No actual perforations or pitting was found on the positive pipe, probably by reason of the fact that the electrical connections were so made as to facilitate as far as possible a uniform electric flow from one pipe to the other, not specially localised in one place. The actual electric quantity passed, 662 ampere-hours, is theoretically equivalent to the removal of about 3.5 to 4 cu. in. of iron. Since the pipe had a length of 36 ft. and a diameter of 5 in. its surface is approximately 6,500 sq. in. or 45 sq. ft. Hence the oxidation of a comparatively small thickness of the iron uniformly all over the pipe would, electro-chemically speaking, account for the electric quantity passed. The difference between the two pipes amounted in effect to a greater rate of "aging" of the positive pipe. It is, however, certain that if the electrolytic action, which in this case was tolerably uniformly diffused over the whole pipe surface, had been concentrated at one particular place the erosion would have assumed a more serious aspect. In the experiment none of the conditions served to direct the exit of the current to one limited area on the positive pipe.

If it were not for the resistance introduced at the joints of the pipes and at the surfaces by rust or oxides, the conductivity of a cast iron pipe would always be much greater than that of the soil which it displaces. The resistance introduced by bad or oxidized contacts, or by films of moisture, paint or preservative compound may altogether overbalance or outweigh the resistance of the mere run of the pipe material. I calculate that if there were no joints at all, the electrical resistance of 5-in. cast-iron water pipe would be about 1.50 ohm per 100 yards or say 1.3 ohm per mile. If leaded junctions are made in the usual way between fairly clean surfaces the joint resistance may not be large. In the case of the pipe experiment, above described, made at Chelvey, I measured at the end of the six months the total resistance of 27 ft. of the 5-in. cast iron pipe which had been the negative pipe. This length included two leaded joints. The whole resistance was found not to exceed 1.25 ohm.

Let us consider next the electrical conditions in the neighborhood of an electrical overhead system of street railway. In all cases where the uninsulated tram rails are used as a return, it is unquestionable that some fraction of the return electric currents will come back through the earth from the distant or more remote portions of the track to those near the generating station.

In the case of long electric street railways worked on the rail return system it is unquestionable that the difference of potential, between the different portions of the track when cars are running, involves as a certain consequence the flow of current through the earth, however efficiently the rail bonding may be carried out. Mr. H. F. Parshall has stated that in tests carried out on an eight-mile track, cutting the rails at the center and inserting an ammeter, showed that 60 per cent of the current was returning through the earth itself.

It appears that the following statements may be taken as correctly representing facts, in the case of electric street railways having uninsulated rails used as a return circuit:—

1. Bonding of the rails, if uninsulated, will not entirely prevent the flow of current through the adjacent earth when there is any difference of potential between different parts of the line, and even with good modern bonding a fraction of the outgoing current may return by the earth.
2. Some portion of this current will pass through subterranean pipes, the amount being determined by—
  - a. The general or local subsoil conductivity.
  - b. The electric conductivity and continuity of the pipe lengths and depending on joints and material.
  - c. The length and disposition of pipe, and its position as regards the average equipotential surfaces in the earth, when the line is working.
  - d. The condition of the pipes as regards oxidation or incrustation with non-conducting oxides or protective covering.

The position which seems most likely to be favorable for the passage of current into the pipe is when it extends for some distance parallel with the rails and passes near the point of junction of the return feeder to the power station and the rails, and when it is new or fairly clean and well jointed; all conditioned, of course, by the general earth conductivity.

3. The danger areas are those regions in which the pipe current, if it exists, leaves the pipe to get back into the rails or return feeder or even into the same pipe again, but mere difference of potential between the pipe and the rail is not in itself a source of danger to the pipe. There must be, in addition, electrolytic conduction of current out of the pipe into adjacent soil, which contains electrolysable salts and the necessary moisture.

4. If electrolytic conduction out of the pipe exists at any places there is no absolute security in the Board of Trade limit of 1.5 volts for the potential difference of pipe and rail, except in so far that the less the voltage the less rapid will be the damage. Electrolytic corrosion may take place when only a small fraction of a volt difference of potential exists between the iron pipe and the adjacent portions of the rail return.

5. The conditions most to be feared as provocative of pipe destruction are when certain local soil conditions exist near the places where the pipe is most positive to the rail. The presence of soluble chlorides in the soil produced by presence of sewage, brine springs, infiltration of sea water if near the sea, solution of chlorides of sodium, potassium or magnesium or other salts present in the soil produced by water due to pipe leakage or natural accumulation by rainfall saturating the soil, set up at once conditions permitting electrolytic conduction, and the resulting liberated acid or chloride ions attack the cast iron pipe. In rapidity of destruction under this action, a new clean pipe may possibly succumb even sooner than an old one protected by a dense adherent coating of oxide, which is not a very good conductor. The time which any such action takes to reach a stage destructive to the pipe will be obviously less the more the electrolytic action is concentrated on a limited area of pipe surface.

6. As the conditions determining possible pipe corrosion are



numerous and not all easily predetermined, it is important in the case of every electric traction system with uninsulated earth returns, that an electrical survey should be made at intervals, setting down on a plan, showing rails and pipes, the potential differences between them at various places. Within the danger area a close watch can then be kept, whenever the ground is opened up for any purpose, for evidence of destructive electrolytic action on buried pipes.

Dr. Fleming has considered the causes and conditions of electrolysis but has suggested no remedies. In this connection Albert B. Herriek contributed an article to the "Engineering Magazine" which is quoted in part:

"As the product of electrolysis is in itself an insulator where iron is concerned, the currents traversing the water or gas pipes continually vary, both in quantity and direction, as the continuous action increases the resistance of both, tending to divert the current to other paths. The temperature and moisture of the earth affect these currents.

"There is no panacea for the evils arising from electrolysis, but there are general treatments which greatly relieve the condition. The damage is done when the current leaves the water pipe. If these points of departure are determined, by measuring the difference of potential between the rails and the affected system of underground conductors, and if the volume of current flowing through the parallel conductors adjacent to the railway system is known, certain areas where the current leaves the water or gas pipe and returns to the rail or to the ground will be indicated. It is generally assumed, but not correctly, that the difference of

"It often becomes necessary to determine what should be done by the railway company to protect the property of the gas and water companies from the deterioration due to electrolysis. It is not necessary, as a rule, to impose any great burden on the railway company in order to accomplish this, if the system is gone over carefully and an examination made to determine the causes and localize those points where the action is dangerous.

"The methods of determining these localities are very simple, but tedious; the following tests, if properly plotted out, will

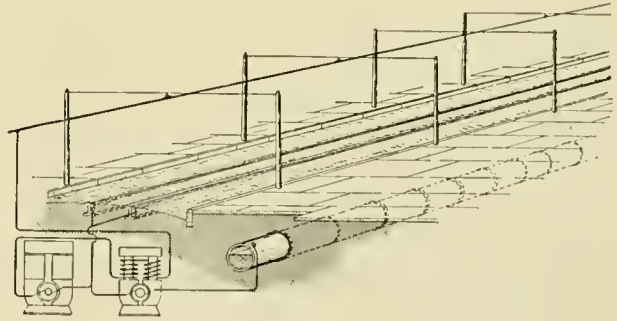


FIG. 3—METHOD OF ELIMINATING ELECTROLYSIS.

indicate the points which must be determined before the remedy can be indicated. Starting from the power station, and connecting the rail and the exposed water plug by a voltmeter reading to about 10 volts maximum, to be sure that good electrical connection is made on both, a difference of potential will be shown between these two points ranging from 1-10 of a volt to 25 volts. It is well to observe this as a car approaches and recedes from the point of test. If the polarity changes; if the pipe is positive to the rail as the car approaches, and negative to the rail as the car recedes—the car is delivering a large part of its current to the water pipe system. If two adjacent plugs show a remarkable difference of potential, it is sometimes due to a bad joint in the water pipe system, between the plugs. The method of testing the current flowing in a pipe is applied as follows: if the tension between two adjacent plugs is by means of a long pressure wire can be determined, and if these two plugs then short circuit by means of a cable of low conductivity through an ammeter, Fig. 2, the current flowing in this short-circuiting cable and the potential being known, it is easy to determine what the flow of current is in the pipe when the shunt of known resist-

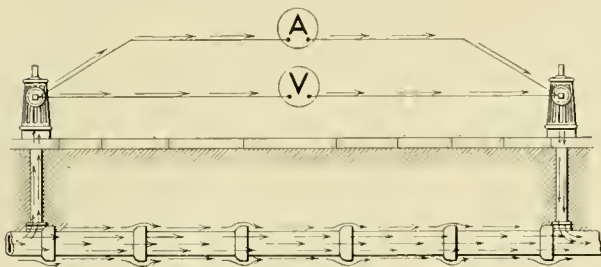


FIG. 2.

potential between the water-pipe system and the railroad indicates the true extent of electrolysis. It does indicate a tendency to divert the current, if the rail is negative to the pipe, but the amount of current diverted can be determined only by electrical measurements on the water pipe itself. The distribution of negative and positive areas must also be considered. The negative areas are adjacent to the power station, whereas the positive areas are the outlying districts. This is the case where the trolley is positive, which is the usual practice. It is evident that, if conductors were attached to the water pipes at the points where they are positive to the rail and carried back to the negative poles of the generators, the current would follow this path in preference to returning through the earth to the rail. This will reduce local electrolysis, but will tend to increase the flow of current through the water pipe, and, if there are any bad joints in the water pipe, the pipe will be badly eaten at these points. Cast iron fittings and cast iron pipe are not attacked or destroyed nearly so rapidly as wrought iron pipe. Lead surfaces and brass nipples connecting lead surfaces with wrought iron pipe suffer quickly from electrolysis. Gas pipes carrying an insulating medium are not so subject to marked depreciation from electrolysis, unless the ground return of the railway is in very bad shape. There is a condition of water distribution which has to be carefully guarded against. In the old systems of water piping cement-lined sheet iron pipe was used. Now wrought iron pipe has been so cheapened that these systems have of late been extended with wrought iron pipe. With this mixed system of piping the matter of electrolysis may become very serious, as the current enters the wrought iron pipe on its way to the station, only to be diverted as soon as it meets the high resistance offered by the cement-lined pipe, whereupon it disseminates through all metallic surfaces, such as gates and surface pipes.

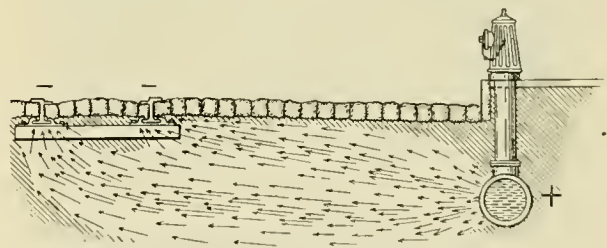


FIG. 4—GRAPHIC EXAMPLE OF ELECTROLYSIS.

ance has been placed around the pipe, for the current will flow proportionately to the resistance of the two paths of the water pipe and the shunting cable.

"The remedies applied are: first, to connect the rail to the water pipe at points where the pipe is positive to the rail; second, to use feeders, preferably by connecting the pipe at this point directly back to the station. Another method is to take the current from the water mains through a dynamo whose potential is negatively lower than the rail-return dynamo. Or the return through the ground and water pipes may be fed through the armature of a low potential machine, keeping this system electrically negative to the rail, so that the current does not leave the water pipe system, but naturally returns through this generator as the lowest potential point in the system, Fig. 3. The excellency of the bonding of the track and the proper placing of

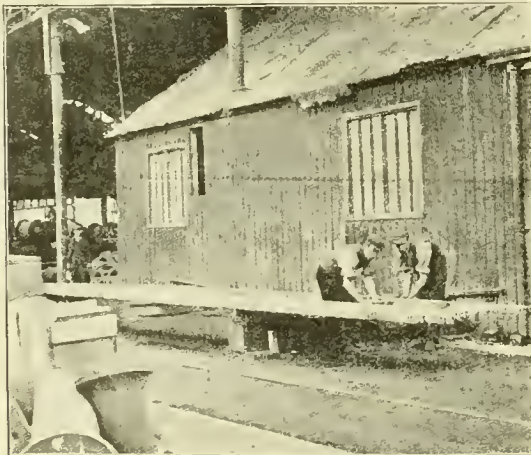
ground-return feeders is the most practicable and direct method of reducing electrolysis. If care and attention are given to these details, electrolysis can be reduced in most instances to a negligible quantity; this can be assured also by a few subsidiary feeders connected to the water pipe system.

"Another interesting point is the question of the responsibility of railroad companies for depreciation of the water pipe plant. As no one has a right to the earth or to earth return, the responsibility of the railroad company has yet to be defined. Electrolysis is characteristic in its action. It will pit and seam piping in a way that rust does not, and in lead pipe solvents are always present in large quantities around or adhering to the pipe. Electrolysis in brass always eats it to needle points or knife edges. The soil through which the railroad and the pipes run has a great deal to do with the division of current between the two parallel circuits of water pipe and rails. Clay, as a rule, is the best insulator. Loam charged with salt water offers the lowest resistance. If loam or clay be charged with coal gas or sewer gas, the resistance is greatly reduced. Dry sand ranks next to clay as an insulator, and wet sand next to loam. Soil having water underlying it is always a low conductor; the current leaving the rail increases the capillary activity of the soil and draws water towards the rail. The rail positive to the soil is always moist."

### MEASURING RESISTANCE OF STEEL RAILS.

In England, where the Board of Trade regulation permits a drop in potential of seven volts only, it is necessary to have the trolley line, feeders, rails, bonds and all connections to the circuit of low resistance. To easily and quickly measure the resistance of rails intended for electric railways, Elliott Brothers have devised a simple apparatus by which manufacturers and inspecting engineers can make this determination.

The illustration from "Engineering" shows the operation in progress at the works of the North-Eastern Steel Company. The rails, which in this particular case weigh about 1,120 lbs. each, are brought up on a truck and slid off on to a pair of steel rails fixed at a definite distance apart. A considerable number of



TESTING RESISTANCE OF STEEL RAILS.

lengths can be laid down and tested one after the other. As each rail is tested it is laid across two steel knife edges a definite distance apart, and two cables are connected to the rail outside these knife edges, by means of clamps. This part of the work can, of course, be done by the ordinary laborers employed about the yard.

The method consists in the correct measurement of the total current furnished by a few storage battery cells, and passing through the cable and necessary regulating switches and rheostats through the part of the length of rail under test, and the obser-

vation, by means of another instrument, of the exact difference of potential existing between the knife edges upon which the rail under test is laid. These two measurements immediately give the value of the resistance in ohms of the section of rail between the knife edges, which is really all that is required.

By using instruments of the Weston type, their dead-beat character enables the readings to be taken almost instantaneously, and with great accuracy: by plotting out a suitable diagram giving a range of resistances in terms of current and difference of potential values, the results can be worked out in ohms without any calculation at all, and the actual conductivity of the rail determined in terms of a sq. in. section of pure copper, or any other specified value. Of course, the resistance itself dealt with is extremely small, possibly only one or two ten-thousandths of an ohm. But by means of the method briefly described above, tests are being obtained perfectly consistent and capable of being repeated time after time with exact coincidence on the same samples.

The instruments are arranged on a small switchboard in a convenient way for being read. The whole apparatus lends itself to rapid work, and will be found most practical. The tests are quite inexpensive, since the entire rail forms the test piece, and there is no preparation required.

### WHAT "RAILWAY" OR "RAILROAD" MEANS.

On page 740 of the REVIEW for October, an abstract was given of the opinion rendered by the United States circuit court of appeals in a case brought under a Montana statute, in which it was held that the word "railroad" or "railway" in a statute did not necessarily include street railways. In that case the question was whether a judgment for personal injuries was a prior lien on a street railway because the statute said it should be so with any "railway corporation."

On October 14, the superior court, at San Francisco, dismissed an application of the California board of railroad commissioners for a writ of mandamus to compel the Market Street Railway Company to produce its books. The commissioners wished to fix a schedule of street car fares, because it had power to fix passenger fares on "railroads." The court held that "railroad" as used in the statute does not include street railways. It is stated that the commissioners will carry the case to the supreme court.

### A SMALL LINE.

Paso Robles, California, has what is perhaps the smallest of street railways. The track is a single line, three miles in length, running from the railroad station through the town of Paso Robles to the mud baths. The rolling stock consists of one bob-tail horse car and the sole owner and operator is M. S. Prime, who bought the road and franchise some years ago; the franchise has 44 years to run yet.

According to the "San Francisco Call," the utmost license prevails on this car, smoking being allowed within as well as without, and the old gentleman has provided a small but select library for those of his passengers who have a literary bent. This lonely car has other advantages not to be despised. There is never any danger of collision, as it holds undisputed sway; it knows no complicated transfer arrangement, such as prevails in our metropolitan system, and has driven many a distracted passenger to an early grave or to drink. And just think of the ribbons being handled by the president of the road himself! What a sense of security! Added to this, the road is the mecca of small boys, who are allowed to ride free by the generous proprietor, a condition of this privilege being that when the car is going up grade they jump off and help it along by vigorous pushes, a condition faithfully carried out.

Mr. Prime is not of a grasping disposition, as most monopolists are. He is satisfied with little, as the following will show. Being asked one evening how business was with him, he replied: "Very good today. I had three passengers this morning and five this afternoon." These, at 20 cents each for the round trip, would make his receipts just \$1.60 for that day.



## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

**Stipulation of Counsel as to Proposed Construction Excluded.***Chicago General Railway Company v. Murray (Ill.), 51 N. E. Rep., 245. June 18, 1898.*

A stipulation made by counsel for a street railway company during the trial of a condemnation case, relative to certain filling and paving, and to the proposed construction of a stone wall which it was supposed that it would be necessary to build on the line separating the land taken from the rest of the lots, the supreme court of Illinois holds it was not error to exclude from the jury, it not appearing that counsel had any authority to bind the company in that way as to the manner in which the company should use its roadbed.

**Should Look Again for Car.***Doherty v. Detroit Citizens' Street Railway Company (Mich.), 76 N. W. Rep., 377. Sept. 27, 1898.*

A person who starts to cross a street and, at a distance of 12 feet or thereabouts from a street railway track in such street, looks to see if a car is coming, and sees none, but does see a covered grocery wagon that might hide a car from view, the supreme court of Michigan holds, should look again before stepping upon the track, lest, as in this instance, the wagon should have concealed a car from view when he first looked, and, not taking the precaution to look but the once, he cannot recover for injuries sustained by being struck by a car almost instantly after reaching the track.

**Patent for Advertising Rack for Street Cars Narrowly Construed.***Newton Street Railway Company v. American Street Car Advertising Company (U. S. C. C. A.), 88 Fed. Rep., 795. July 19, 1898.*

While the United States circuit court of appeals gives expression to entertaining doubts whether the advertising rack for use in street cars covered by letters patent No. 380,696, issued April 10, 1888, to Isaac H. Randall, involves invention or patentability, yet, admitting that both were found in it, the court declares that the patent must be held so close and narrow that it is not infringed by a structure that cannot be described, in the language of the patent, as "an article complete in itself, adapted to be readily attached to the car at the place specified," or, in the language impressed upon the patent office, a rack "complete and in condition to receive cards when not fastened to the car."

**Peremptory Writ of Mandamus Denied Where Right of Road Is Not Clear.***In re Forty-Second Street, Manhattanville & St. Nicholas Avenue Railway Company v. Collis (N. Y.), 53 N. Y. Supp., 669. July, 1898.*

Instead of granting a peremptory writ of mandamus to compel the commissioners of public works of the city of New York to issue a permit to open Amsterdam avenue in order to change the motive power of the railway company from horse power to electricity, the special term of the supreme court in and for New York county holds that a peremptory writ of mandamus can never be issued except in case of clear legal right, where the validity of the company's claim is not disputed, and the allegations and inferences of facts which it presents to the court are not contested, and that in other cases, as in this one, an alternative writ should be issued, instead of a peremptory one.

**Removal of Switches Put in Conditionally or Without City Authority.***Rapid Railway Company v. City of Mt. Clemens (Mich.), 76 N. W. Rep., 318. Sept. 20, 1898.*

The authority to put in a Y at a certain street was granted with this proviso: "That said grantee, its successors or assigns, shall if ordered to do so by the common council of the said city, remove said Y switch within sixty days after service upon it of a copy of the order of the common council directing it to do so." The council ordered this Y taken up. The company refused to take it up, and applied for an injunction to protect itself. But the courts have decided against it.

If injunctions can be used for such a purpose, why, asks the supreme court of Michigan, may it not be used after the 30-years' franchise granted to the company has expired? The Y was accepted with the conditions imposed, just as the franchise was accepted with the limitation as to the length of time which it should exist. The railway company was bound by these conditions. The city was under no obligation to confer the right to construct a Y on the street referred to, and, when it conferred that right, it was competent for it to attach conditions which must be observed, declares the court.

Another Y was put in, between midnight Saturday night and midnight Sunday night, without the authority of the city, under an arrangement with the president and manager of another company, whereby not to exceed 150 feet of the latter's track, on either side of the first company's line, was also to be used for switching. But not withstanding that this latter company had the right to put in such turnouts, switches and side tracks as might be deemed necessary, and especially in view of the ordinance conferring it providing that the whole length of road authorized by this ordinance should be deemed one route, and the rate of fare over said road should not exceed 5 cents, the supreme court of Michigan holds that this second Y, which was intended to make a turning point for the company first mentioned, was not authorized by the charter for the second company, and like the other Y, could not be protected by injunction against the city.

**Crossing Prescribed as Adequate to Reasonably Subserve Public Safety.***In re Saddle River Traction Company (N. J.), 41 Atl. Rep., 107. Aug. 22, 1898.*

A crossing of a steam railroad by an electric railway was planned for the latter at the intersection of two streets where the steam railroad curved upon a radius of about 2,000 ft. and crossed practically at right angles the street containing the electric railway, which street was upon a grade of about 2 per cent, while it crossed the other street at an angle of about 30 degrees, which street was likewise upon a slight grade, the crossing of the railroad and the two highways being at the same grade, close to which crossing the railroad maintained a depot for passengers and freight.

During 24 hours fairly selected with a view to ascertaining the usual travel over the crossing, about 2,300 pedestrians, 460 vehicles, one-half of which were bicycles, and 38 steam railroad trains, 10 passenger trains and 28 freight trains, went over the crossing, and, in addition, switch engines crossed at irregular intervals, a dozen or more times.

Called upon to define the mode in which the crossing should be made, as provided by statute, Mr. Chancellor McGill, of the court of chancery, of New Jersey, although expressing a preference for an undergrade crossing of the steam road, if it could be made without a decidedly disproportionate expense to the electric railway, holds that the public safety could be reasonably

subscribed. Instead, by the use of derailing switches constructed at a safe distance—30 ft.—on each side of the steam railroad, so that the electric car could not proceed without being derailed, until some one should have crossed the steam railway tracks, and, by means of a lever or other contrivance constructed upon the opposite side of the steam railroad, have closed the switch; the switch to be so constructed that, the moment the lever was released, it automatically opened again, so that some one must hold the lever to keep the switch closed. There must also be an overhead trough to keep the trolley from accidentally leaving the electric supply wire while crossing the steam railroad tracks. Added to this must be the requirement that the conductor of the trolley car should go over the steam railroad in advance of his car, and, after seeing the steam road clear, close the switch, and signal the motorman to advance. Nor were the gates already maintained by the steam railroad company at the crossing to be overlooked as additional protections against accidents.

#### Distribution of Electrical Power to Private Consumers Not Authorized.

*Chicago General Street Railway Company v. Ellicott (U. S. C. C.), 88 Fed. Rep., 941. July 5, 1898.*

This was a suit for injunction to restrain the city of Chicago, its mayor, and its electrician, from cutting the wires of the complainant carrying an electrical current from the latter's generator to private motors in the lumber district of the city of Chicago. This company was organized under the laws of Illinois for the purpose, among other things, of constructing and operating a heating, lighting and power-supply system within the present or future limits of the city of Chicago.

It may be assumed, says the United States circuit court, that the city has no power by ordinance to prevent the complainant from engaging in or carrying on the business of furnishing power, heat and light, as its charter provides, or from furnishing such power, heat and light both to street railway companies and to private consumers. It may also be assumed, it thinks, that any usual, lawful and authorized means of attaining the benefit of this general power is within the complainant's general charter rights, and is constitutionally free from impairment or attack upon the part of the city. A power to furnish heat, power and light implies the power to adopt the usual and lawful means of attaining that end.

But, the court holds, the complainant has no right, under its charter, in the absence of a grant from the city, to erect its poles or string its wires along the streets of the city. The general charter from the state does not carry with it a grant to the use of the streets. The power to give or withhold that grant lies in the city government.

Moreover, the language of an application of a company operating a street railway only for a permit being limited to a request for one to suspend two necessary feed wires from a line of poles already constructed, and on a route described, to be maintained for the purpose of supplying electrical current to be used for operating, heating and lighting purposes, the court declares that it cannot assume that the city understood that these additional wires were to be used for the conveyance of the electrical current to private consumers.

Therefore, the court holds that a city may, under such circumstances, by ordinance, or any other action, refuse the right of such a use, and may, if necessary, enforce that refusal; at least, it insists, it is clear that the complainant has no right founded on the constitution or laws of the United States to compel the use of the city's streets for the purposes named, without a permit having theretofore, for that purpose, been granted.

And, for these reasons, it holds that the motion for an injunction must be denied in this case.

#### Cars, Trucks and Supplies are Held Attachable.

*Risdon Iron & Locomotive Works v. Citizens' Traction Company, of San Diego (Cal.), 54 Pac. Rep., 529. Sept. 10, 1898.*

This was an action on a promissory note. A writ of attachment was issued in it, the same to be levied on certain cars,

trucks, electric goods, and supplies, fire-proof safes, etc., the property of the traction company, then used and necessary to be used in and about its business of operating a line of street railway. The traction company moved the court to discharge the attachment on the ground that, considering the nature of its business as a carrier of passengers, and the uses of the attached property in that behalf, the same was not subject to attachment for the company's debt. The court ordered that "said attachment be discharged in respect of said property."

First of all, the supreme court of California holds that from this order an appeal could be taken under the provision of the Code allowing an appeal from an order dissolving an attachment, notwithstanding that the company strenuously argued that an order for the release of attached property on the ground that it was not liable to seizure under the writ, was not an order dissolving the attachment.

As to the merits of the order, the supreme court says that, in its opinion, the quality of the exemption from execution which pertains, except when otherwise provided by statute, to the franchise of a corporation such as this traction company, does not extend also to property of the kind attached in this action, although it may be proper, or even necessary, to operations under the franchise. Such property, it says, does not emanate, mediately or immediately, from the state, like the privileges embraced in a franchise; it has no character of personal trust, as in the case of the franchise; and, in the court's opinion, it is subject to attachment or execution in like manner as other property not exempt by statute.

There are respectable authorities, it admits, which hold a different doctrine, but the court says that it is disposed to think that they are not supported by the better reason.

Whether the rule of liability to attachment or execution should extend to lines of railway, or to parts of other similar aggregations of property susceptible of use only as a unit, the court did not deem necessary to be decided, in this case. But the cars, trucks, iron safes and other movables seized under the writ in this action, it maintains, were not such property.

For these reasons, it holds that the order appealed from should be reversed.

#### No Authority to Compel Giving of Transfers.

*City of Atlanta v. Old Colony Trust Company (U. S. C. C. A.), 88 Fed. Rep., 859. May 31, 1898.*

This was an appeal from an order of the United States circuit court continuing an injunction, pending the litigation, restraining the city of Atlanta, Ga., from executing an ordinance, which it had passed, making it unlawful for any company operating electric or other railways in or upon the streets of that city to charge or collect more than 5 cents for the transportation of any person from any point on said line or lines operated by said company, whether the same be for a continuous passage on a through line or by transfer to any other line or lines owned and operated by said company, and providing that upon the payment of one full fare as above, it should be the duty of said railway company to transport such passenger to his destination upon any line or lines of said company, and to furnish a transfer ticket, without additional charge, whenever it was necessary for such passenger to change to the car of any other line or lines operated by said company in order to reach his said destination. The order or decree appealed from is affirmed.

Under the charter of the city, empowering it "to pass all by-laws concerning \* \* \* carriages, wagons, drays," etc., "and every by-law, ordinance and regulation that it may deem proper for the peace, health, order and good government of said city," the circuit court of appeals declares that there was no power given to the mayor and general council to pass and enforce the said transfer ordinance.

Nor does it consider that the charter of a street railway company, although containing a provision "that the rates of fare and freight upon said railroad shall be subject to the approval of the mayor and city council," makes the rate of fare on its lines subject to the initial control of the mayor and general council of the city.



Likewise, it denies that state statutes, ratifying and confirming the incorporation of street and suburban railroad companies, which provide that companies whose charters are thus legalized shall be subject to such "regulations" as are other railroad and street railroad companies, give the right of regulating and fixing fares and transfers on street railways to the city.

Finally, under the constitution of the state of Georgia, which prohibits any street railway company from building upon the streets of a city without its consent, and under the reservations made by the city of Atlanta in its ordinances granting such consent, the court holds that the power is not reserved to the city to pass any ordinance which it sees fit, compelling street railway company to give transfers and issue transfer tickets between the several lines of the company.

#### Highway Cannot Be Left at Will and Right of Way Secured by Condemnation.

*Harvey v. Aurora & Geneva Railway Company (Ill.), 51 N. E. Rep., 163, July 22, 1898.*

The supreme court of Illinois says that a street railroad, as is well understood, is a road constructed on a street or highway for the purpose of carrying passengers living upon, or having business on, such street or highway; its main object being to accommodate street travel. For this purpose the cars make frequent stops to take on and discharge passengers along the street or highway. Constructed as it is upon a public street or highway, it has no use for private property, unless it might need a small track for a side track, turnout, or station, as an incident to its main line.

Keeping in mind the functions, duties, and purposes of street or horse and dummy railroads, the court holds that the power to take private property conferred upon a street or horse and dummy railroad company by section 2 of the Illinois statute of 1874, entitled "An act in regard to horse and dummy railroads," is not general, but is a limited power, limited to a case when it becomes necessary to resort to private property, which necessity must be shown in the petition to condemn.

The section referred to declares that "when it is necessary for the construction, maintenance or operation of such road, or the necessary sidings, side tracks or appurtenances to take or damage private property, the same may be done." Giving this language a strict construction, which, the court says, must be done, it holds that a street or horse and dummy railroad company can not, in the construction of its road, whenever it sees proper, leave the highway upon which it is authorized by the board of supervisors to construct its road, and take private property against the will of the owner.

If, in the construction of the road in the highway, difficulties or obstructions are encountered which render it impracticable to construct the road in the highway, the court suggests, a necessity might arise, within the meaning of the law, which would authorize the company to leave the highway and go upon private property, until the difficulty encountered is overcome, when a return can be made to the highway. Or, if sufficient land cannot be had in the street for side tracks, turnouts, or stations and they are necessary for a successful operation of the road, under the statute the company would have the right to resort to private property. So, too, if a necessity exists, in the construction of the road, for making a deflection from the highway in order to avoid a heavy grade which would prevent a successful operation of the road the company would no doubt have the right, the court thinks, to take and condemn private property to obviate the difficulty.

But the court insists that a company has no right to abandon the highway and undertake to construct its line of road over private property, when it is not necessary to do so in the construction, maintenance, or operation of the road, and that a petition for condemnation in such a case should be dismissed on motion. Mr. Justice Phillips, alone, dissents.

Whether a company is authorized to exercise the right of eminent domain, it is further held, is a question to be determined by the court on a motion to dismiss its petition in condemnation pro-

ceedings, and, if the motion be overruled, the property owner has the right to be heard on the question of compensation and damages in the contest before the jury, without waiving any rights he has acquired by the motion to dismiss the petition.

In this last case the evidence heard on the trial will not need to be preserved in a bill of exceptions, where the finding of the jury is not called in question or controverted in any manner, appeal being taken from only the order denying a motion to dismiss the condemnation proceedings.

#### Liability for Assault and Battery Made Upon Passenger by Motorman.

*Hanson v. Urbana & Champaign Electric Street Railway Company (Ill.), App., 474, June 3, 1898.*

The contract which exists between a street railway company, as a common carrier, and a passenger, the appellate court of Illinois holds, is a guaranty on behalf of the carrier that the passenger shall be protected against personal injury from the agents and servants of the company in charge of the car or train. The company places a motorman in charge of the latter. It alone has the power of removal. And, justice, the court thinks, demands that the company shall be held responsible for the motorman's wrongful acts toward passengers while he is in charge of the car or train carrying them.

Here was an action brought to recover damages from an electric street railway company for an assault and battery made upon a passenger by a motorman. The motorman, it seems, had called the passenger, who was conducting himself in an orderly manner, to come to him, and commenced a conversation with him upon a subject of his own choosing, namely, concerning an account the other had been trying, as a lawyer, to collect of the motorman, and while talking, struck him a blow in the face without justifiable provocation, and in the presence of other passengers.

Under these circumstances, the court holds that an award of 85 cents damages was inadequate, as the evidence demanded substantial damages, even if the passenger had been guilty, as the motorman alleged, of calling him a vile name, as that would not justify the motorman in inflicting upon the passenger the blow he did.

On the other hand, the court holds that there could be no recovery from the company for an assault and battery made upon the passenger by the motorman after the passenger had arrived at his destination and safely alighted from the car on the public street, and was twenty-five feet from the car and near the sidewalk, as the contract of carrier and passenger was then at an end.

There was no guaranty under the contract, the court says, from molestation by the carrier after the passenger had left the car and entered upon his journey homeward.

Evidence that the passenger had threatened, some months prior to the conflict, that he would make the motorman lose his job, if he did not pay a certain bill he held against him for collection, the court holds, should have been excluded as immaterial.

Neither does the court think that the evidence should have been admitted to show that the motorman had been arrested and fined for both assaults, and had paid in fines and costs the sum of twenty-five dollars. The company, it says, did not pay, and was under no obligation to pay, the costs or fines in those cases, and it was in no way interested in either of the judgments entered in the criminal cases.

The hypothesis stated in certain instructions given the jury that, if the assault grew out of a personal difficulty between the passenger and an employe of the company about their personal affairs, or if the passenger attempted to transact private business between him and such employe on the company's car, and that such difficulty and the transaction of such business had no relation whatever to the carrying of him as a passenger, but was an entirely private matter between him and such employe, then the company was not liable for such assault, the court says was not sustained by the evidence, nor was it sound in law.

The motorman, by calling the passenger to him and engaging

him in conversation for a few minutes, the court insists, did not suspend the guaranty the passenger had, to be carried to his destination without molestation or assault from the agents and employes of the company.

#### Constructive Put Upon Power to Regulate Mode and Manner of Crossing.

*In re Saddle River Traction Company (N. J.), 41 Atl. Rep., 107. Aug. 22, 1898.*

Under "An act to regulate the crossing at points not within the limits of cities of this state of steam railroads by steam or electric railroads hereafter to be constructed," approved March 22, 1895 (2 General Statutes of New Jersey, p. 2717), there seems to be now no question but that, concerning a crossing at grade, the chancellor is empowered only "to define the mode in which such crossing shall be made." But where the crossing is not at grade, the language of the statute is that the chancellor, by his decree, may define "and regulate the mode and manner of such crossing." What construction is to be put upon this?

It was argued in this case that, in virtue of the authority conferred upon the chancellor by implication from the obvious intentment of the statute, the decree which defines the mode of crossing legalizes not only a disturbance of the highway by an electric railway, after its route shall have been duly established, in the erection of a crossing in accordance with the decree, but also the changes of grade incident to such erection, so that no municipal action is necessary, and, the work being executed with proper skill and care, no action can be maintained by the owners of abutting buildings for consequential damages.

With this view, however, the court of chancery of New Jersey does not agree. It says that it does not perceive that the words "regulate" and "manner," added with reference to a crossing not at grade, imply any power in the chancellor to give authority for a change in the grade of the highway. The chancellor's duty is merely to prescribe the mode of crossing, and regulate its use. The crossing must be made according to his prescription, and in no other way. As to how authority shall be had to effectuate the crossing prescribed, the statute is silent. The authority conferred, it seems, is to end with the chancellor's edict.

Therefore, although it might be convenient if the chancellor could authorize the work of the crossing to be done, and apportion the expense equitably between steam railroad and electric railway, and bring in owners of buildings abutting upon the highway suffering damages consequent upon the execution of the prescribed mode of crossing, and adjust their damages, and compel their payment, the court declares that the statute does not give such power.

"Reasonably practicable," as the term is used in this statute, the court further holds, does not refer to engineering problems alone, as bearing upon the mode of crossing to be prescribed by the chancellor. In its opinion, every element of the situation must be considered, and the cost must be given its weight, when, in balancing the possibilities of accident under the several methods of crossing, it appears that the reasons for an expensive crossing do not greatly preponderate.

And consequential damages must be reckoned as part of the expense of an undergrade crossing.

Reverting again to this particular case, the court says that the change of grade necessary to an undergrade crossing of the steam road would have to be made by authority of the borough, and, if it should act, it would be subjected to recoveries by owners of houses damaged by the change of grade, while, if the electric railway company should itself proceed to change the grade without action by the borough, it would be a trespasser, and as such, responsible for damages.

#### Effect of Greater New York Charter on Action of Local Authorities.

*Blaschko v. Warster, Mayor, the East River & Atlantic Ocean Railroad Company, and Others (N. Y.), 51 N. E. Rep., 363. Oct. 4, 1898.*

This was an action brought by a taxpayer to restrain the city

authorities of Brooklyn from granting consent to operate a railroad in the streets, and to restrain the East River & Atlantic Ocean Railroad Company from receiving any such consent. A preliminary injunction was granted, and the order affirmed in the appellate division of the supreme court of New York. Thence the railroad company appealed, on certain certified questions, its object being to secure a reversal of the order granting the injunction, as a basis for a claim of damages upon the undertaking given by the plaintiff in the action, because the municipal authorities to whom the railroad company had made application for the consent had, during the pendency of the action, gone out of office by force of the charter consolidation of the two cities of New York and Brooklyn so that they could no longer grant the application even if the injunction which restrained them had originally been improperly granted.

The questions certified by the appellate division for the consideration of the court of appeals, when condensed, may be stated as follows: (1) Whether the new charter (section 73, chapter 378, Laws 1897), when approved, deprived the local authorities of Brooklyn of power to grant such consents to a railroad for a period beyond 25 years. (2) Whether a general consent that the railroad might operate its road in certain streets named in the resolution, without any limitation as to time, is good for 25 years.

It appears that the aldermanic branch of the city government passed a resolution granting the consent in question generally, without any limitation as to time, on the 29th day of November, 1897. This resolution was in the hands of the mayor when this action was commenced, and he stated in his answer that he intended to disapprove it, so that what the railroad lost by the injunction, if anything at all, was the chance of having the resolution passed by the aldermen over the veto of the mayor.

Without scanning too closely the right of the railroad company to review the order granting a preliminary injunction, in the court of appeals, in this condition of the action, the court concluded to examine and dispose of the questions certified.

The section of the new charter above cited provides that "After the approval of this act no franchise or right to use the streets, avenues, parkways or highways of the city shall be granted by the municipal assembly to any person or corporation for a longer period than twenty-five years," the city referred to being, of course, the new city created by the act, and the prohibition applying to all the territory embraced within it. On behalf of the railroad company it was contended that the restriction did not take effect until January 1, 1898, and therefore had no application to proceedings for granting franchises before that date.

But the court of appeals says that it was clearly intended by section 73 to restrict the granting of railroad franchises "after the approval of this act," that is to say, after May 4, 1897, and it thinks that the words "municipal assembly," found so frequently in the new charter, were employed here to designate the aldermen, common council, or governing body having the power to deal with the subject-matter of the restriction prior to the date when the new government was to go into full operation; and, therefore, it holds that the new charter operated to restrict the power of the aldermen or city authorities within the territory comprehended within the limits of the new city thereby created, and, consequently, that the restriction applied to the board of aldermen of Brooklyn when the resolution in question was adopted.

Taking up the other question, the court says that, when it was avowed that the appeal was brought in order to lay the foundation for a claim of damages against the sureties on the bond, the railroad had no right to a construction of the consent or resolution different from the intention of all the parties when the application was considered and passed upon, and that a court ought, under the peculiar circumstances of the case, to construe the consent in the same way as the parties themselves did when it was asked and given. The city authorities, it goes on to say, had the power to make the grant for 25 years, but that was not the power that the railroad called into action, that the aldermen exercised, or the court restrained, but the unlimited power invoked and claimed independent of the new charter. For these reasons, the court holds that the consent, so far as it



was given, was not a valid exercise of the power to grant consents for 25 years.

What would have been its decision had a grant actually been made and in form perfected, and had the litigation thereover been for the purpose of securing the benefit thereof for 25 years, the court does not here state—whether it would have been the same or not.

But the court of appeals does not dismiss the case at this point. It takes pains to suggest that, when a case that otherwise is not reviewable is sent to it upon special questions, the questions should be so framed that the answers may determine the particular controversy involved in the appeal, and not merely a part of it, as the practice adopted in this case would permit the party defeated in the court below to pick out all the weak propositions involved in the particular ground affected with error, ignoring all the other grounds, present them for review, and ask the reviewing court to reverse the judgment or order in case it agreed with him in respect to this single ground, although the decision below might, as possibly in this case, stand well upon all the other grounds

## FREIGHT ROAD AT SAN ANTONIO, TEX.

The first electric freight line in the south was opened on October 8 at San Antonio, Tex. It is operated by the Texas Transportation Company, and comprises a little over two miles of track, extending from the yards of the Southern Pacific Railroad to a point near the City Brewery of the San Antonio Brewing Association. Numerous spurs reach to the various buildings of the brewery plant.

Many legal difficulties were encountered in building the road. The general incorporation law of Texas enumerates the purposes for which corporations may be organized, and prior to 1897 the operation of an electric freight road within city limits was not one of them. The promoters of the road, at the last session of the legislature, had little difficulty in procuring an amendment so that section 21, of article 642, of the statutes, now reads:

"For the construction, acquiring and maintaining and operating street railways and suburban belt lines of railways within and near cities and towns, for the transportation of freight or passengers; which may, also, construct, own and operate among depots; but no street railway company shall ever be exempt from the payment of assessments that may be legally levied or charged against it for street improvements; and for the establishment of companies to buy, own, sell and convey the right of way upon which to construct railroads; provided, that all street or suburban railways engaged in transporting freight shall be subject to the control of the Railroad Commission."

Under this law the Texas Transportation Company was organized, and then came a flood of injunctions. The litigation resulted in favor of the company after tedious delays, and the road was built.

The roadway was prepared under the direction of the roadmaster of the Southern Pacific; it is laid with 80-lb. rails. The trolley wire is placed high enough not to interfere with men standing on the tops of freight cars.

The equipment consists at present of one 100-h. p. electric locomotive and a number of standard freight cars, but a 200-h. p. locomotive is soon to be added, as the smaller one cannot handle the traffic.

This line is one of the very few railroads that started business with enough patronage to insure its permanency. By an arrangement with the City Brewery all the heavy freight for the brewery will be received and the output shipped out over the line of the Texas Transportation. Based on the figures for September this business alone will amount to about 12,000,000 lbs. monthly. This gives only a partial idea of the magnitude of the business done by the City Brewery, for the figures do not embrace all shipments, but only the most important items. This has heretofore been handled by wagons, but the business of the brewery has grown to such proportions as to make it extremely difficult to handle it with wagons.

The officers of the Texas Transportation Company are: Otto

Koehler, president; Otto Wahrmond, vice-president; directors: Otto Koehler, Otto Wahrmond, Oscar Bergstrom and J. J. Stevens.

## TWO NEW BRILL CARS.

In the REVIEW for July last, page 488, was illustrated a new type of car built by the J. G. Brill Company for the Liverpool Tramways Company. Some months' experience in their use and a further study of the problem has produced a modified form which has many advantages over the car as first built. The first and most noticeable feature from the outside is the fact that



READY FOR SHIPMENT "IN THE WHITE."

the open compartment has its side raised to the same height as that of the closed compartment. This gives a greater protection to the open seats and increases the strength of the side by using two panels of the usual width instead of one. The compartment is practically quite as open to the air as before. The next feature is the arrangement by which a single step places a passenger



INTERIOR OF CENTER-OPENING LIVERPOOL CAR.

practically within the car. This result is obtained by dropping the floor of the center vestibule down to the level of the bottoms of the sills. A step 14 in. from the ground with a 13-in. riser gives access to the vestibule floor. Having reached this point a passenger enters either of the compartments by a 9-in. step. As slight as this change may seem yet it will undoubtedly greatly increase the speed of the car.

As in the cars previously constructed there is a transverse seat in the vestibule. It is furnished with a reversible back and accommodates two persons. The tracks on which the seat slides are now made flush with the vestibule floor. The yoke and the framing by which two parts of the car are united have been somewhat modified and the bracing and angle iron transoms now make

this portion of the car lighter and stronger than before. Slight modifications have been made in the platforms, one of these being a narrow opening in the dasher so that the motorman can reach his place without passing through the car or climbing over the dasher. As in the previous case, the car is mounted on a pair of "Eureka" maximum traction trucks. The closed compartment is practically the same as a standard American closed car, while the

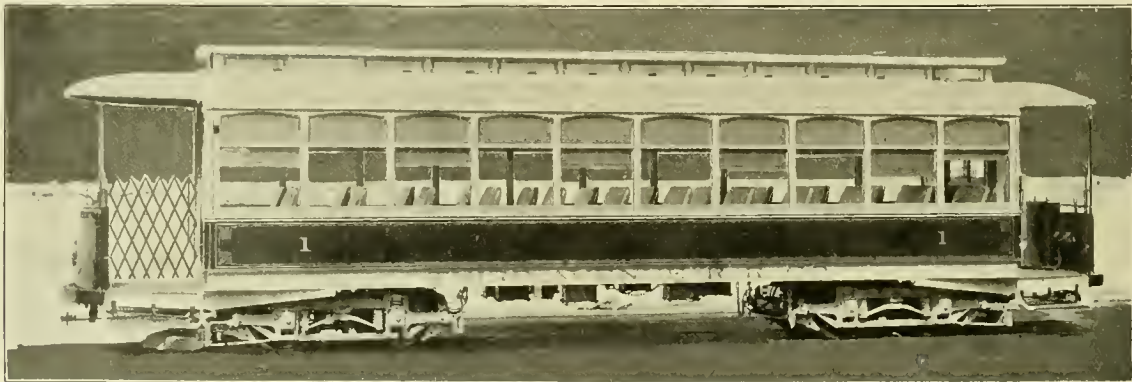


THIRD AVENUE CAR.

open compartment has slat seats and is without sash. In the engraving showing the interior of the car, the movable seat is shown slid into the centre of the doorway. The general dimensions of the car are: length of body, 29 ft. 6 in.; width over all, 6 ft. 8 in.; total length, 33 ft. 6 in.; length of closed compartment, 12 ft. 8 in. and of open compartment, 13 ft. 10 in. The platforms are but 2 ft. in length. The improved form of car seems to meet many if not all objections which have been made to the style of car as it was originally constructed. The car was shipped "in

In designing the new cars it was seen to be imperative to have a car that might be sent out closed or open as the case might be. Heavy loads must be carried on this line and the road is to provide for a very large proportion of long rides. It was for this reason that the cross seats were adopted instead of longitudinal seats. While the longitudinal seats with ample standing room in the aisle gives a greater capacity, the fact is that the selfishness of the public cuts down the seating capacity at times by at least one-third. With cross seats there is no question as to the number of seats available in the car, at the same time the long riders are much more comfortable if they face in the direction in which they are going. The upper end of the Third Avenue Railroad is practically a suburban line where the speed can and must be high while the Yonkers connection, which is probable in the near future, will give a 20-mile road, a large part of which is through an open country where the speed need not be limited. This of course calls for double trucks and No. 27 G or "Universal" truck has been adopted for the purpose; four motors are used and the trucks are fitted with electric brakes. While the present line is operated by cable, the introduction of electricity is going on and the road will undoubtedly use the underground trolley for operating these cars.

The construction of the cars is a novelty; the side and end sills are made of a continuous double channel iron between which the posts are set; the sides are straight and are sheathed up with narrow matched stuff. The windows have a sash in two pieces with metal styles and are arranged so that they will drop down into the wall of the car entirely below the rail. This rail is about the height of an elbow of a passenger when seated. The opening in the side of the car is covered by a neat tight fitting cap. This arrangement makes the car practically an open one; the usual curtains are fitted to protect the passengers against the weather as in the open cars. There are 24 seats giving a seating capacity of 48. The seats are of the "walk over" pattern and as seen from the interior view are somewhat of a novelty. There are no hand poles or straps. The corner of the seat is cut off at an angle and a handle completes the outline; this has many advantages over the



CAR FOR THIRD AVENUE ROAD, NEW YORK.

the white." this saving a great deal in protecting paint and varnish, while the packing was much more close.

Another car equally interesting is a sample car now building for the Third Avenue Railroad Company, of New York. Mr. Robertson, the general manager of the road, in providing rolling stock for the present service, is confronted with many unusual conditions which are not easily met. First, the Board of Health requires that one car in every four shall be closed or practically of the box type. This rule covers both night and day and winter and summer. The general public largely prefers open cars and they are demanded for more than half the year. The possession of the required number of closed cars by no means settles the question of operation, for, as every manager knows, it is difficult always to have a car of specified type at the required place at the required time.

old fashioned dangling strap, since it is available for everyone. The seats and backs are covered with pantasote, which, while it does not hold a person as firmly in place as plush, is much cleaner, looks better and for this special traffic is probably the best material that could be selected. It also has the advantage of being smooth and ladies have less trouble in leaving the seats than they would with plush. The general dimensions of the car are 32 ft. in length, 8 ft. 2 in. wide at the sills; the platforms are 4 ft. 6 in. long; the step is 15½ in. from the rails and has a 14-in. riser. The wheels are 33 in. in diameter and the trucks have a 4-ft. wheel base with truck centres 22 ft. apart. The motors are rated at 27 h. p. each. The head-lining of the car is white maple veneer decorated and gloss finished. The doors are double automatic and the floor is covered with longitudinal strips. The total weight of the car without motors is 36,000 lbs.



## ELECTROLYSIS OF CAST IRON WATER PIPES AT DAYTON, OHIO.

Read before the American Society of Municipal Improvement at Washington, D. C., October 28, 1898, by Harold P. Brown.

The injury of water pipes by electrolysis is at present so well understood that my only excuse for again calling your attention to the subject is found in the peculiar and unusual conditions disclosed at Dayton, Ohio, in an examination made last July.

All of us know that electrolysis may be expected to injure lead and wrought iron pipes on the lines of electric roads within a radius of half a mile from the power house, but we have believed that cast iron mains were safe.

Our faith has been rudely shaken by the condition of those pipes at Dayton. They appeared to be entirely uninjured and the black paint seemed to be unaffected. But on scraping the pipe with a knife, the metal was found so soft that grooves could be cut into it. Therefore, sections were removed for mechanical and chemical tests, and the results fully justify your most careful attention, since your own pipes may perhaps be in a similar condition.

Dayton is a beautiful city, with a population of about 90,000. Its streets are remarkably well paved with granite blocks and asphalt, having foundations of unusual thickness and solidity. The large number of modern sky-scraper office buildings and handsome stores in the business portion give it quite a metropolitan appearance. It has fully 80 miles of electric roads and over 225 cars.

Electrically considered, it is cut into four parts by the Stillwater and Mad rivers, which unite to form the Great Miami, and by Wolf creek, meeting the Miami two miles or so below. Three of these parts are further subdivided by canals. The business portion of the city is thus practically located upon an island and the electric current used by the street cars must follow the rails across bridges or pass on the pipes under the river to get back to the power house.

Practically 90 per cent of the entire current from the business portion of the city crosses the river on one 12-in. and one 10-in. water pipe, one 8-in. gas pipe and one 10-in. natural gas pipe.

The two main power houses are about  $\frac{1}{4}$  mile apart, on the west side of the Miami river. A third but smaller power house is on the east side of the river, but quite a distance south of the business portion of the city. Two other roads have their terminals in Dayton, but their power houses are elsewhere.

Following my ordinary methods, a switchboard was mounted on a wagon and provided with a complete set of Weston electrical instruments reading from one ten-thousandth part of a volt per degree up to 750 volts, and from  $\frac{1}{2}$  an ampere to 150 amperes.

At each hydrant along the electric roads of the city a reading was taken from the trolley wire to each of the four rails; from the trolley wire to the pipe and from the pipe to each of the rails. These measurements were made in sets of three in such a manner that any poor contact or any defective condition of the testing apparatus was at once indicated and corrected. The instruments had recently been compared with standards and were known to be correct.

Over 2,500 electrical measurements were made and the results of the readings are plotted out upon the accompanying map of the city. On this map the numbers marked (+) show the pipe positive to the rail and those marked (-) show the pipe negative to the rail.

Fifteen excavations were made and the measurements repeated on the pipes themselves. These excavations are marked on the map with a square, either solid or open, as the pipes were found injured or uninjured. A careful examination was then made of the physical condition of the pipes by J. H. Shaffer, metallurgist; and chemical analyses were made of samples of soil and the metals of the pipes and incrustations upon them. These were made by E. E. Brownell, E. E., and James O. Handy, chief chemist.

These electrical tests showed that the pipes in the business portion of the city,  $\frac{1}{2}$  to 2 miles from their power houses, were positive to the rails and therefore subject to electrical corrosion.

The highest readings in this part of the city were  $4\frac{1}{2}$  volts near Fifth street bridge and near Washington street bridge.

Near the power house on the west side of the river, the pipes were 9 volts positive to the rails and the danger district extended about  $\frac{3}{4}$  of a mile to the west.

In the southern part of the city the highest positive reading was 2 volts in front of the Oakwood avenue power house.

In making the electrical tests, the time of the reading was noted, since the pressure depends on the amount of load carried at the power house and will vary correspondingly in all parts of the city. For instance, in front of the power house of the Peoples' Railway, on Washington street, at 5 p. m., during the heavy load, the pipes were 9 volts positive to the rails, while at 2 p. m. they were but 6 volts positive.

It was at once evident that the danger district was extremely large since the entire area showing positive voltages is in such an electrical condition that lead and wrought iron pipes would be injured. This was verified by the records of the Water Board, which showed a large number of service pipe renewals. These renewals are very expensive in Dayton because, as previously stated, the foundations of pavements are unusually heavy and unusually well constructed.

The Board of Water Works very wisely refuses to allow any one to tear up the pavements. When a permit for excavation has been secured, only the trained employes of the paving department are allowed to remove the paving. After the work is completed no one but these same employes can fill in the hole and replace the pavement. This replacement is so well done that no traces of the excavation are evident.

Unless a remedy for the electrical condition of the pipes is very quickly applied in Dayton, it is certain that a large amount of excavating, replacing of pipes and paving will need to be done.

Cast iron pipe is not usually affected by electrolysis since the coating of adherent moulding sand and tar paint protect it.

In the ordinary soil an iron pipe submitted to electrolytic corrosion is covered with a layer of iron oxide, which is a poor conductor of electricity, so that with a given pressure, the deeper is the layer of rust and the slower the rate of corrosion.

But, to my surprise, the soil surrounding pipes in Dayton gives an entirely different reaction when a current passes through it. The tar seems to be no protection whatever and the surface of the pipe in the danger district is changed into a soft black material resembling graphite and easily cut with a knife.

This material is such an excellent conductor that instead of checking, it tends to increase the action by reducing the resistance of the path through which the current must flow in order to reach the rail. Moreover, the stones and pebbles near the pipes are actually electro-plated with the metal of the pipe, whether iron or lead, as can be seen from the samples exhibited. This condition I had never before seen, and as far as I know, it has not been previously reported.

Since my Dayton report was published, I have received a letter from Dabney H. Maury, Jr., Superintendent of the Peoria Water Company, Peoria, Ill., in which he states that he has encountered the same phenomena.

In order to electrically deposit a layer of metal, two things are necessary; first, a liquid which will dissolve the metal, and second, an electrical current exceeding 0.01 of a volt in pressure flowing away from the metal through the liquid.

The fact that the pebbles are electro-plated showed that both these conditions exist, but in order to prove conclusively that the soil itself did not injure the pipes, a pipe surrounded by the same soil was uncovered in another portion of the city where there was absolutely no trace of an electrical current. This pipe was on Logan street, near the canal; the records showed that it was put down in 1874, while the pipe taken out at the west end of Fifth street bridge had been in use ten years and exposed to electrolysis for four years. If the damage was caused by the soil itself, this pipe would of course have been in a worse condition than the Fifth street pipe. But the Logan street pipe was apparently as good as new.

To make the comparison absolutely beyond criticism, a section of each pipe was taken out, chemically analyzed and mechanically tested. The chemical analyses of the iron pipes were nearly identical, and are as follows:

	Logan street pipe.	Fifth street pipe.
Phosphorous .....	.789 per cent	.800 per cent.
Sulphur .....	.073 per cent.	.057 per cent.
Silicon .....	2.270 per cent.	2.500 per cent.
Iron .....	not det.	not det.
Carbon graphitic .....	3.43 per cent.	2.88 per cent.

The samples of the incrustation of the Fifth street pipe analyzed as follows:

Phosphorus .....	1.821 per cent.
Sulphur .....	none.
Silicon .....	not det.
Iron .....	33.43 per cent.
Carbon combined and carbon graphitic .....	7.12 per cent.

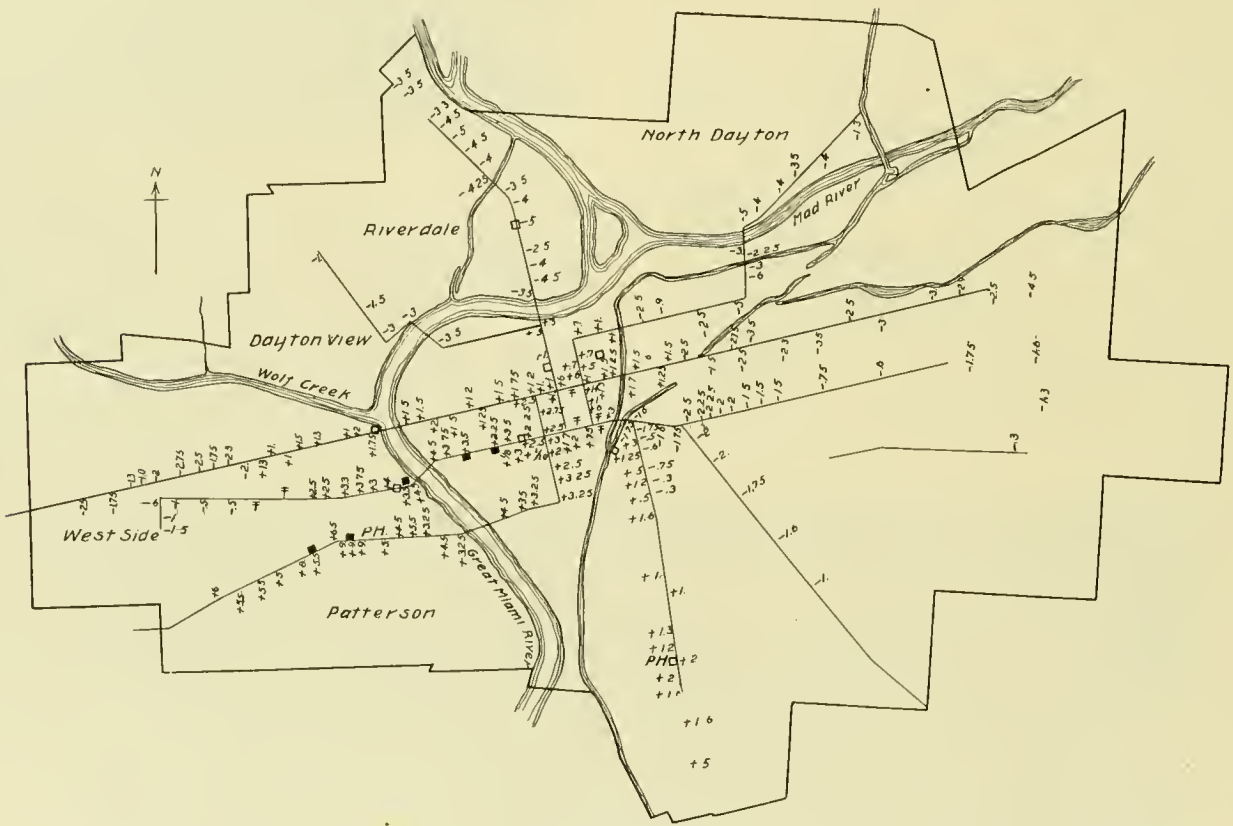
This analysis showed that the percentage of iron was greatly diminished, while the percentage of carbon was more than doubled; careful investigation showed that the carbon was

has sustained this pressure. With a knife or file, soft spots can be found in a pipe from 1-16 in. to 1/4 in. deep.

With higher electrical pressures the extent of the injury is even greater. In all cases the damage is directly proportional to the pressure and to the length of time during which the current has been flowing; while it is inversely proportional to the distance between the rails and the pipes.

By reference to the electrical pressures indicated on the map accompanying my report, one can approximately determine the number of feet of water mains affected. In my opinion all main and service pipes in Dayton are seriously injured where submitted to 3 volts pressure or more for two or more years when within 4 ft. of the rails.

This would mean less than one mile of mains but with lead or wrought iron service pipes, the pressure limit should be as low as one volt. Chas. E. Rowe, secretary of the Water Works, however, feels that 17,513 ft. of mains should be replaced at a cost of \$77,000.



MAP OF DAYTON, O.

merely the amount originally in the pipe, the carbon being left, while a large portion of the iron had been carried away.

The chemical analyses of the soil showed that the solvent was produced electrically from carbonate of sodium and chloride of sodium in the soil. Neither of these by itself in the small proportion shown by the analysis would injure a cast iron pipe covered with tar, though, as is well known, a strong solution of chloride of sodium (common salt) will rust wrought iron.

But the presence of even 0.01 per cent reduces the electrical resistance of the iron and the passage of the current decomposes those salts and forms hydrochloric acid, which dissolves the metals. Having thus determined the cause of the trouble, it remained to fix its extent. Fifteen excavations were made in different parts of the city to determine how much electrical pressure is required to seriously injure the cast iron.

A pressure of 3 volts and less is found to cause a graphitic coating not exceeding 1-32 in. in depth; the iron seems to be uninjured.

From 3 to 4 1/2 volts the thickness of the layer is increased in a ratio depending upon length of time during which the pipe

To determine what percentage of mechanical injury has been sustained by the pipes, it was intended to compare the hydrostatic pressures required to rupture the Logan street and the Fifth street pipes, but defects in the apparatus employed prevented a fair test.

The Fifth street pipe at 150 lbs. pressure leaked through the corroded spots, while the other pipe was able to stand 300 lbs. pressure. Test bars were cut from the best portions of both pipes and broken on a Riehle testing machine. The average transverse strength of the Logan street pipe was 1,800 lbs. per sq. in., as against 1,085 lbs. to the other.

The tensile strengths were respectively 16,000 and 11,425 lbs., and the deflections were 0.25 and 0.20 in. Four years of electrolysis had robbed the Fifth street pipe of about 30 per cent of its transverse strength and about 45 per cent of its tensile strength and had caused it to leak at 150 lbs. pressure.

Since I wished to avoid any suspicion of unfairness, I asked the managers of each of the three leading electric roads to allow their experts to accompany me, and to check my instruments, methods and readings. This was cheerfully done, and I received



from these gentlemen full information concerning their plants and connections, as well as every possible courtesy during my examination.

The rail joints on several lines of road had recently been removed, the rail ends brightened with the sand blast and the "castweld" joint applied. This was done by the railways with an idea that it would reduce electrolysis as well as make a fine mechanical joint. It was a success mechanically, but was an electrical failure, as was shown by tests of individual joints and by electrical measurements of several stretches of 1,000 to 1,200 ft. of the four rails and of the pipes below them.

The measurements were compared with others made last February on same rails before the "weld" was applied, when very small bond wires were used on the rails. There was practically no variation in the results as would have been the case had the "weld" possessed high electrical conductivity.

I found that two of the rails were carrying no current whatever, while the other two carried but one-twentieth of the amount of the current on the pipes below them. And yet some men will tell you that a "weld" can be made by pouring 60 or 70 lbs. of molten iron around 40 or 50 lbs. of cold steel rails buried in moist earth.

I feel confident that if the railroads would unite in the expenditure of from \$5,000 to \$7,000 for the proper electrical apparatus and connections, all the water pipes in Dayton could be maintained negative to the rails.

Then the pipes would harden, as is the case with the section of the pipe which I have brought to show you. Moreover, any further electrolysis that might occur would be in the opposite direction and would, therefore, add a layer of metal to the pipes instead of injuring them. I will not here enter into a discussion of the electrical methods required in Dayton to obtain this result, but it is evident that no plan heretofore suggested for electrolysis prevention will effect a cure there, owing to the unusual conductivity of the soil and the peculiar division of the city.

But I would like to offer a few comments and four or five practical suggestions. Do not imagine that because your pipes are not leaking and bursting that they are safe from electrolysis; if the electrical conditions are against them, they are getting weaker day by day. On the other hand, do not antagonize the railway companies, the moment that the subject of electrolysis comes up in your city; they are not intentionally injuring your property and if a friendly talk is had and a joint investigation is made, you are likely to get the speediest and most satisfactory action.

The railway manager is as much interested in stopping the trouble as you are; every pound of metal taken from your pipes means to him a heavy loss of power, increased investment for engines, boilers, dynamos and conductors. And if it is finally established by legal decisions that his current has injured your property he will have to settle the bill.

The best course for all concerned, it seems to me, is to take mutual action while that bill is small and not wait until a bursting main during a fire spreads the loss over the entire community. The usual procedure brings a dead lock. The water works people discover signs of electrolysis and at once pounce upon the railway managers. They either refuse to believe that they are responsible for the trouble and thus bring upon themselves a shower of threats, or they say that although they cannot admit the fault is theirs, they are, nevertheless, willing, rather than earn the ill will of the public to do anything in reason if the others will only tell them what to do.

Then the others suspect some cunningly bidden legal trap and decline to give any directions whatever. And so nothing is done.

There seems to be an idea prevalent that if the water board suggests to the railway any scheme for stopping the trouble, and the scheme is then tried and fails, the railway is thereby freed from any further responsibility. How anyone can believe that the mere following out of a plan of experiment would cancel indebtedness is beyond my understanding.

It is giving a legal tender value to the acceptance of a suggestion, which seems to have no basis in fact, in equity or in law. But this idea has cropped out in so many cities that I rather hesitate about offering the following practical suggestions:

1. It will not be a mistake to follow Dayton's example and

obtain complete and accurate information concerning the electrical, chemical and mechanical condition of your pipes, especially in the vicinity of the power houses. The trouble may be confined entirely to the lead in the service pipes and in the calking of joints on your mains; but even here serious damage may result if the matter is neglected for years.

2. Do not put down any more lead or wrought iron service pipes, as those are the first victims of electrolysis, and their replacing means ruin to pavements. Use instead, wooden pipe, banded with a close spiral of hoop iron and covered heavily with asphaltum.

This will stand the heaviest pressure in use and is not affected by electrolysis, since the hoop iron is low in conductivity and is not electrically connected at the joints. Its cost is said to be reasonable and it has a successful record of many years service.

3. Use the same kind of pipe for new mains in any district in which a railway power house is likely to be erected and heavily paint the lead calking of cast iron mains, using asphalt or petroleum wax.

4. In the danger district along the lines of electric roads, and on intersecting streets, put into your water and gas mains two or more consecutive lengths of these wooden pipes so as to break the electrical continuity of the mains and thus make their resistance greater than that of the rails. Fill in the space around them with broken stone and connect with drain if possible.

5. Midway between the wooden sections on each main, attach insulated pilot wires, leading to a central office. Connect similar wires to rails nearest the pipe wires and make daily electrical tests at times of heavy load. If any section shows positive to the rails, cut it at once into smaller sections and call upon the railway to rebound its line upon that street.

This, with the proper electrical management of the railway feeder wires and apparatus, will effectively protect your mains.

### A PROGRESSIVE MEXICAN MANAGER.

N. Escalante, general manager and a large stockholder in the street railway company in the city of Merida, Yucatan, has been spending a few weeks in this country, and on his return east from the Omaha exposition spent a week in Chicago, a considerable portion of which time he placed at the disposal of the REVIEW. Mr. Escalante has an exclusive, long time franchise in a city of 80,000, and enjoys special privileges from the government in the nature of remitted taxes and immunity for his employes from the usual military service. He has been steadily improving his road, and operates a fine pleasure resort in which he recently installed one of Armitage & Herschell's—of North Tona-wanda, N. Y.—largest sized riding galleries. It proved a great success and is very popular.

Mr. Escalante has also inaugurated a funeral car service which is used by the best people. During the rainy season the street leading to the cemetery is often three feet deep with mud, and the advantages of street car service in place of carriages is evident.

The lines include some 36 miles of track, radiating from the center of the city, and the hauls are short in most cases. As the maintenance of animal power is high, the cost of feed per head being about double what it would be here, Mr. Escalante is considering conversion to electricity. The road is in a prosperous condition, paying good dividends, and its business growing steadily.

Mr. Escalante is a thoroughly up-to-date, progressive manager, and in his own city is nicknamed "the Yankee" on account of his American methods. Although a young man he is a banker, conducts large hemp plantations, and is an extensive importer.

It is rumored that the Third Avenue Railroad Company, of New York, will undertake electric lighting business if the necessary franchises can be secured.

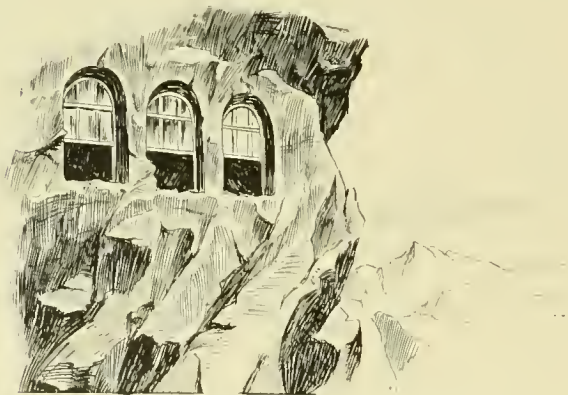
The contract for carrying the U. S. mail from Washington, D. C., to the distributing office at Sligo, Md., has been awarded to an electric railway; this contract was formerly with the Baltimore & Ohio.

THE JUNGFRAU ELECTRIC RAILWAY.

The first section of the famous Jungfrau mountain railway was opened for traffic on September 19. This bold undertaking will be one of the wonders of the world when it is completed. There are other mountain railways which are equal to this in some respects. The Pike's Peak railway carries the tourist to an altitude of 14,147 ft. while the Jungfrau station will be 13,670 ft. above the sea. The Pilatus railway has a gradient of 48 per cent. while the maximum grade of the Jungfrau will be 25 per cent. But when one considers the rough, rocky, craggy pathway and the mountains through which tunnels will be driven, and finally the vertical shaft up which the tourists will be carried in elevators to the very roof of Europe, no one can doubt that this will be the boldest and foremost achievement in short railway construction.

The project was conceived by Herr Guyer-Zeller, of Zurich, after a careful survey of the mountain range of Eiger, Monch and Jungfrau in August, 1893, and concessions were sought at once. After many difficulties and much opposition the franchise was granted, but with some unusual provisions. Every passenger must be insured, the company must build and equip a fine observatory, and at any time the council may reduce the fares 50 per cent for the native population. The railway will be built primarily for the tourists and it is evident that they will have to pay for it. The provision for insuring passengers was due to the fear of injurious of fatal results to persons passing quickly to a high altitude and into a rarified atmosphere. By experiments with animals it was decided that the ill effects of mountain climbing was chiefly due to the violent exercise. As the passengers ride comfortably in the cars, making the ascent in an hour and forty minutes with several stopping places where they can get out and rest if discomfited, it is believed that no one in good health will suffer.

The engineering difficulties were appreciated by the projectors and in order to get the best plans an international prize contest was inaugurated. Engineers and manufacturing firms of Switzerland, Germany, America, England, France and other countries



EXTERIOR OF MOUNTAIN STATION.

submitted plans and specifications. Over \$6,000 was distributed in 16 prizes, and the best features of each were incorporated in the final draft. The estimated cost of the road is about \$2,000,000, half of which is absorbed in tunneling. A forecast of traffic receipts give an estimated annual income of \$144,000. At a rate of \$7 for a round trip ticket to the summit of Jungfrau, and a proportional rate for the other five stations, it is expected that 43,500 passengers will be carried each year. This estimate does not appear excessive, inasmuch as 150,000 tourists visit that region each season.

The danger of avalanches snow slides and falling rock is eliminated, as the line runs in the interior of the mountain except at the stations, which have been so selected that they are entirely sheltered. The glaciers will be avoided, for their movement would in time destroy the tunnels. At all times the

temperature in the tunnels will be below freezing, so that there will be no difficulty from running water. The last 240 ft. will be a vertical lift to the summit of Jungfrau. Electric elevators, of American make, will carry the passengers to the last station.

The tunnels will be 14 ft. in diameter. The rock of the moun-

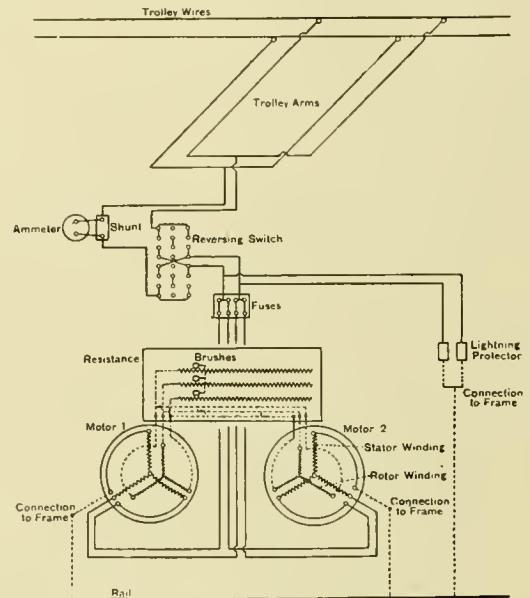


DIAGRAM OF CAR WIRING.

tains is especially favorable for this work, as it is easily loosened by explosives, but has great resisting power to the elements. Electric drills have been used in driving the tunnels and a new explosive has been tried with marked success. It is called 'lithetrit,' and is cheaper and safer than dynamite, is not affected by heat or cold, and generates no noxious gases in exploding.

The tunnels will be lighted by electric lamps, which will be supplied with current from wires separate from the railway circuit. A storage battery will be placed at each station for lighting purposes to provide for any emergencies. The electric current will be used for heating the cars and stations, and this will be necessary at all times on account of the low temperature of the high altitudes. At the Eiger station rotary transformers have been installed to supply continuous current for the rock drills and the lighting circuits.

The following table gives a good idea of the relative position of the stations:

Stations.	Height.		Distance.		Maximum gradient. %
	From station to station. Ft.	Above sea level. Ft.	From station to station. Miles.	From start. Miles.	
Little Scheidegg .....	840	6,770	1.2	0	25
Eiger Glacier .....	1,610	7,610	0.9	1.2	25
Eiger Wand .....	1,140	9,220	1.5	2.1	25
Eismeer .....	850	10,360	2.6	3.6	6½
Jungfrauoch .....	2,220	11,210	1.7	6.2	25
Lift .....	240	13,430	...	7.9	
Summit of Jungfrau ...		13,670		7.9	

There will be two turn-outs on the line, one on the first section and the other in the tunnel. Connection will be made with the Wengernalp Railway, at Scheidegg. The track will be 3 ft. 3¾ in. gage, with 40-lb., 4-in. T-rails laid on steel ties 3 ft. 3 in. apart. The rack, which is fixed to the ties midway





1895  
Jungfrau  
1865 m. E. LEC. WORLD, N.Y.

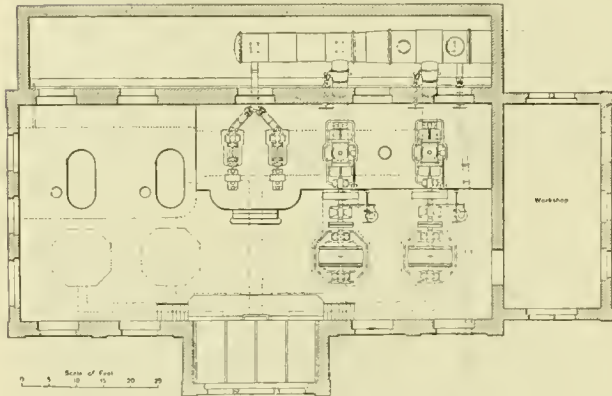
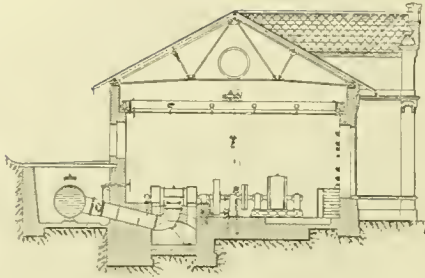
1895  
Mendel  
1865 m.

1895  
Wengernalp  
1865 m.

1895  
1865 m.

THE JUNGFRAU ROUTE.





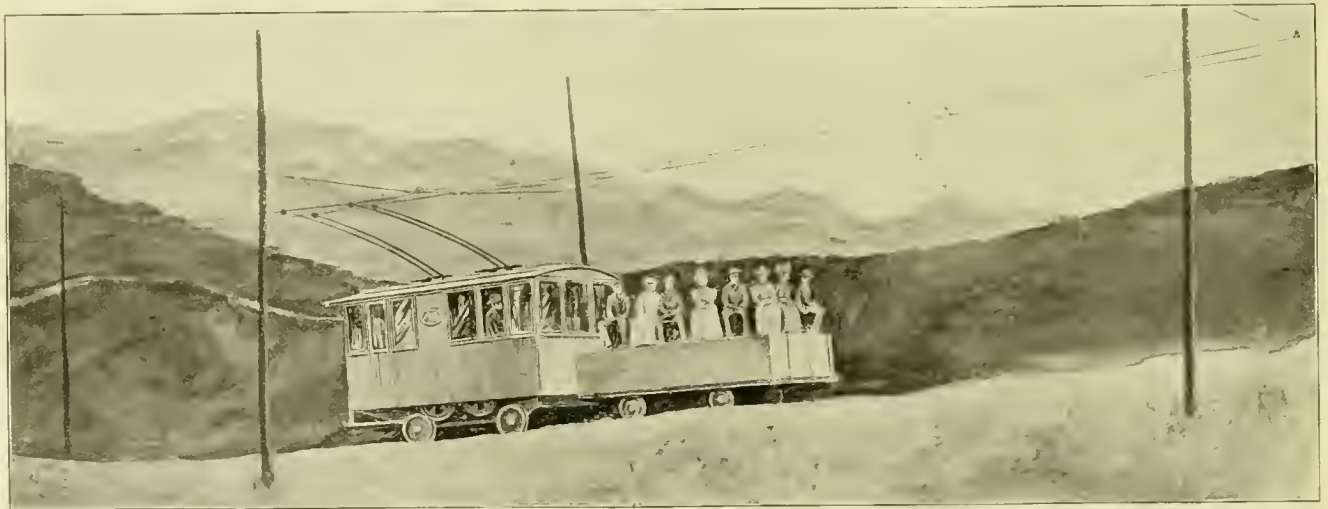
PLAN AND SECTION OF POWER STATION.

between the rails, is of rolled steel, weighing  $68\frac{1}{2}$  lbs. to the yard, and is divided into lengths of 11 ft. 6 in. Each rail joint is connected with two Chicago bonds. The track and rails are so formed as to permit the use of an emergency brake.

The braking apparatus comprises: (1) An electric brake which is thrown in action by the interruption of the current through the motors; this is a regulator, inasmuch as a too high speed

induction motors, which run at a normal speed of 760 r. p. m., taking a three-phase current of 500 volts at a frequency of 38. Each motor drives through double reduction gears a gear meshing in the rack. The locomotive weighs over 25,000 lbs. The passenger car is pushed, not pulled, up by the locomotive, which insures greater safety. It has a capacity for 40 passengers, and usually there will be only the locomotive and one car, but for special occasions two will be put in service in each train. For the present, two of these trains will be run, one up and the other down, but when the line is completed, there will be double that number. Each train complete will weigh 55,000 lbs. The locomotive and truck are almost identically similar to those used on the Zermatt-Gornergrat Railway described in the REVIEW of last July.

The current for operating the railway will come from the water power of the Black and White Lutschine, mountain streams within two miles of the line. As the busy season of this system will be during the summer, it is fortunate that the mountain streams are swollen by the melting snows, so that there will always be an abundant source of power. The power house, already built in the valley on the White Lutschine, near Lauterbrunnen, is shown in the diagram. There are four turbines, two of 500 h. p. each, and two of 25 h. p. each, for excitors. Through a steel pipe line 6 ft. in diameter and 1,500 yards long there is an effective head of water 114 ft. Three-phase alternating currents at 7,000 volts are generated. From the power house the transmission line passes across the slopes of Wengen to the station at Scheidegg,  $4\frac{1}{2}$  miles, where the potential is reduced to 500 volts. The transmission line consists of three wires of hard drawn copper,  $\frac{3}{8}$  in. in diameter, which are supported on triple petticoated insulators. Wooden poles 33 ft. in height are used for the line. The fall in voltage on the line at full load will be about 10 per cent. The loss through the turbines, generators, lines and motors will be approximately 50 per cent. The stations are connected by telephone wires, which are transposed at every 550 yds. to avoid induction from the alternating current circuit. Lightning arresters of the Siemens & Halske high potential pattern are placed at suitable intervals on the transmission and feeder lines.



TRAIN ON FIRST SECTION OF LINE.

causes a break in the current and thus causes the electric brake to act. (2) A hand brake, operated by a lever which applies bronze shoes to the driving wheels. (3) A "pincer" or "tongs" brake, which grips a rail laid in the center of the track; it may be operated either by the motorman or by the conductor, who stands on the upper platform. It has bronze brake shoes or sole plates. The induction motors also act as brakes as they run as generators when the speed reaches synchronism, and in this way retard the acceleration of the train.

The electric locomotives are each equipped with two 150-h. p.

The transmission line is not in duplicate, for it is intended to construct another power house on the Black Lutschine with a capacity of 2,600 h. p. The sub-stations are well built stone buildings, each containing two 200-k. w. transformers, reducing the voltage of the three-phase alternating current to 500 for the two trolley wires. When the line is complete, transformers will be placed every 1,000 yds. along the line.

For convenience in building, the line is divided into sections, each of which will be opened for traffic as soon as completed. The first section, from Scheidegg, passes over a comparatively



gentle grassy slope to the foot of Eiger glacier, and has presented no very great difficulties in construction. The opening was recently celebrated in the presence of many distinguished visitors. Special songs were written to commemorate the occasion, and a play was given in which the three snow-capped mountains, Jungfran, Monch and Eiger, were represented as the principal characters. We are indebted to the "Electrical World" for the illustration showing the three mountains with the route outlined. The work on the railway will not be completed until 1904.

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## NOTES FROM DENVER.

(From Our Own Correspondent.)

The street railway companies in Denver have learned from experience that combination open and closed cars are best suited to the climatic conditions in that city. A rain and wind storm will sometimes come with only a few minutes' warning, and the open cars furnish inadequate protection to the passengers. The plan of running a closed motor car with an open trailer has been tried with some success, although a number of serious accidents have occurred to persons stepping from one to the other while the cars were in motion.

The Denver Consolidated Tramway Company last summer commenced to rebuild all its cars, splicing a closed to an open car and making one large combination motor car. By August 43 combination cars were in operation, 29 of which were built by J. G. Brill Company. The cars are joined by placing an I-beam along each side upon both cars. The first seat panel of the open car is knocked out and the panel built up against the end of the closed car. The roofs are carried over and joined, making a solid roof. The most of the cars will have the Bombay roof, although about 25 will have a monitor deck. There will be six windows on a side and six seats in the open compartment. About 123 of these cars will be constructed.

Another type of car, 40 ft. long, will be built by the J. G. Brill Company. It consists of two compartments, each 18 ft. in length, with a 4-ft. platform at the front, but none at the rear. The platform, which is at front of the closed compartment, will be vestibuled. Access to the open compartment is from one side only, as the inside will be screened and no step provided. In fact the company is putting screens on all its open cars and is considering the plan of removing the steps on that side. On the other side, the new cars will also be screened with a step at the center with gates, which can only be operated by the motorman from the front platform. There will be a round seat accommodating eight passengers at the rear end of the cars. Brill double, high speed trucks will be used for this type of car.

The company is now building, at its shops in South Denver, four large snow plows, which are powerful enough to easily cope with any snow drifts in Denver. A Taylor truck is being given a trial and has proved so satisfactory that the company is thinking of ordering more of them.

Transparent signs are now fitted on all the cars, and these have been received with much favor by the street car patrons, and the board signs are to be done away with except on the sides of the roof. The front deck lights were removed and a sign on cloth, with white letters and a black back ground in a strong frame, inserted in its place. These are interchangeable and can be seen for a block and a half. The cars are now equipped with a fender built by a Denver company. A new electric brake is being tested and so far has made a good record.

The Tramway Company is about to build a line out East Arapahoe street to Smelters, for which purpose a crossing is now being laid at the central loop. Plans are nearly complete for a 10-story business block to be built by the company over the central down-town loop. The ground floor will be occupied by stores, the second and third by the railway offices, and the rest of the building will be taken up by office rooms and a theater. There will be a passage way underneath for the cars and this way will be enclosed by frescoed walls and well padded to prevent the noise going into the building.

The Colfax Electric Railway Company has been absorbed by the Consolidated, and is now a part of that system. The Colfax Company received a new franchise for 20 years and its indebtedness was wiped out before the consolidation. The whole line will now be re-stringing with new trolley wire, side pole construction replacing the center poles. Most of the track will be relaid with heavier rails, and the power station and car barn will be overhauled. Double truck, combination cars operated on a fast schedule will replace the cars now running on the 9½ miles of track.

On the line extending to Aurora and Fairmount Cemetery a ride of 16½ miles may be taken for 5 cents, and this line is liberally patronized. The company will build a first class summer resort at Aurora Lake. The Chutes Park line is also a very popular one, 8,100 passengers being carried to the park one Sunday recently.

The Loretto Heights Railway Company was formed under unusual circumstances. Father Malone, who is at the head of the Catholic church in Denver, organized the company, which is owned by the church and the Sisters of Loretto. The line, 2½ miles long, connects Loretto Heights and Loretto Academy with the Clifton Car Company. It is a single track with turnouts and a car barn at Loretto. A large academy and school are located at one terminus of the road, and some patronage comes from residents along the route. Three horse cars run on a 30-minute schedule on week days and 20-minute on Sunday. It is expected that the horses will soon give way to electric traction.

The West End Street Railway Company has installed an automatic signal system which greatly facilitates the operation of the cars. For the most part the system is double tracked, but there are still three switches and single track in the suburbs, and the signals now make the long delays at the switches unnecessary. There is quite a rivalry between the West End and the Consolidated Companies for traffic at Elitch's Gardens, Berkeley and Manhattan Beach. Each company keeps several cars at each place and the car crews endeavor to persuade the people to patronize their cars.

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## OFFICERS OF TOLEDO TRACTION COMPANY.

At the annual meeting of the Toledo Traction Company on October 11, the directors chosen were: Norman B. Ream, Chicago; William E. Hale, Chicago; James A. Blair, New York; John B. Dennis, New York; Albion E. Lang, Toledo; Thomas H. McLean, Toledo; Barton Smith, Toledo; Rufus H. Baker, Toledo; William H. McLellan, Jr., Toledo.

The board chose officers as follows: Chairman of the board of directors, Norman B. Ream; president, Albion E. Lang; vice-president, Thomas H. McLean; treasurer, William E. Hale; secretary, Barton Smith.

The only changes are that Mr. McLean, who has been general manager of the company the past eight months, was chosen vice-president, succeeding Mr. Dennis, who is still a member of the board, however; and that Barton Smith was elected as secretary.

The business of the company for the last year has been very satisfactory.

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## ELABORATE OPENING CEREMONIES.

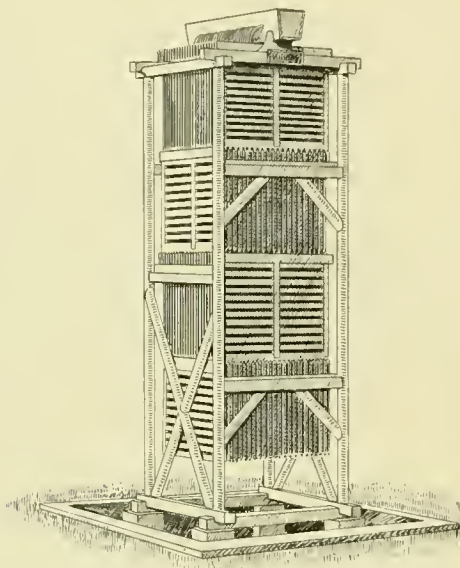
When the electric railway connecting Boundbrook and Plainfield, N. J., was opened last month the citizens of Lincoln, the half-way point, arranged for a celebration of the event. The first train with about 75 invited guests left Boundbrook, and at the corporate limits of Lincoln was boarded by the officials, among whom were three women members of the council. From this point Miss Emma E. Egel handled the controller. In Lincoln the welcome was enthusiastic and the path of the trolley tram was strewn with flowers. In front of the Lincoln Monument a halt was made and the last spike, a silver one, driven by Miss Egel and the other councilwomen. The journey to Plainfield was then resumed; on the return trip a banquet was served at Lincoln.

# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

In a recent issue the "Iron and Coal Trades Review" illustrates what is described as a patent water cooler, for cooling condensing water or other similar use. It is a modification of the old brush heap idea, and while it is no doubt patented one does not readily see what the patentable feature is.

The heated water is pumped to the top of the apparatus, which is about 16 ft. high, and in the interior are arranged a large number of wooden plates in a vertical position. The water is distributed at the top and flows slowly down over the surface, being cooled by contact with the air circulating between the plates.



Where as much as 1 sq. ft. of ground space per i. h. p. is available the natural current of the air is relied upon for cooling. When space is more limited the cooler is built in the form of a tower or chimney which produces a draught sufficient to circulate the required volume of air.

When space is more limited still, the cooling boards are arranged as shown in the illustration and a fan used to circulate the air. In this form only 1-6 sq. ft. per i. h. p. is required with a reasonably economical engine.

\* \* \*

## The Thermal Efficiency of Steam Engines.

In 1896 the Institution of Civil Engineers (English) appointed a committee consisting of Professors Kennedy, Macfarlane, Gray, Ewing and Beare, Capt. H. R. Sankey, and Messrs. Capper, Davey, Donkin, Longridge and Maw, which has recently presented its report. Preceding the report is an introductory note by Captain Sankey to show what it is desired to measure and compare

A steam plant comprises in its simplest form:

1. The boiler with its feed arrangements, to produce the steam.
2. The pipes to conduct the steam to the engine.
3. The engine to transform a portion of the steam energy into work.

Further the plant may include:

4. A condenser with an air-pump or equivalent apparatus, if

the engine is to be relieved from the back pressure of the atmosphere.

5. An economizer may be added to the boiler to improve its performance by transmitting to the feed-water some of the heat which would otherwise escape up the flue.

6. A feed water heater in the case of a non-condensing engine, to recover some of the waste heat in the exhaust steam.

7. Steam jackets and re-heaters added to the engines under certain circumstances.

The diagram, Fig. 1, has been prepared to show the nature and extent of the various losses in such a system.

The various elements of the plant are represented by rectangles of arbitrary size and the flow of heat is shown in a stream of varying width.

The upper diagram represents, in the main, the trial of the Louisville Leavitt pumping engine as described in the Transactions of the American Society of Mechanical Engineers, Vol. XVI., and the data are sufficiently full to enable the flow of heat to be stated at all points with fair accuracy. The numerals represent British thermal units flowing per minute; the streams are drawn to such a scale that each inch of width represents a flow of 100,000 B. T. U. per minute. Temperatures are also given.

Starting at the fire-grate, it is shown that 183,600 B. T. U. are produced per minute by the combustion of the coal, and that 131,700 of these go direct into the water of the boiler, 10,000 are lost by boiler radiation and leakage, and the remainder, viz., 41,900, pass away with the flue gases. On the way to the economizer, 1,000 B. T. U. are lost by radiation, but in the economizer itself 15,750 B. T. U. are diverted into the feed water, 5,000 B. T. U. are dissipated by radiation, and finally 20,150 B. T. U. pass out of the economizer and into the chimney, and are lost to the steam plant. The heat entering the economizer with the feed-water is 5,450 B. T. U., which is added to the 15,750 B. T. U. diverted from the flue gases, thus giving a flow of 21,200 B. T. U. in the feed out of the economizer. Radiation, however, reduces this flow to 20,950 B. T. U. per minute at the entry to the boiler, where a further addition is made of 6,600 B. T. U. returned by the jacket water.

The steam produced by the boiler is thus seen to derive its heat from three streams, as shown on the diagram; the steam finally leaves the boiler with 159,250 B. T. U. per minute. Before this heat gets to the engine, however, 3,100 B. T. U. are lost by radiation and leakage from the steam pipes, so that the flow of heat is reduced to 156,150 B. T. U. per minute, which is the gross supply of heat to the engine; the net supply is less, because there are certain returns of heat to the boiler to be deducted. In the first place credit has to be given to the engine for the heat which could be imparted by means of the exhaust steam to the feed-water, inasmuch as the exhaust is theoretically, and very nearly practically, capable of raising the temperature of the feed to the exhaust temperature. On this basis, 7,400 B. T. U. should be credited to the engine although the actual return to the boiler, or rather to the economizer, is only 5,450 B. T. U. The difference is due to excess of circulating water, which lowers the hot-well temperature, and also to radiation in the feed arrangements, which are a necessary portion of the steam plant, independent of the engine proper, and which are not applied to correct any fault of the engine. The loss of 1,950 B. T. U. should therefore be debited to the feed and condensing arrangements, and not to the engine. It will be seen that the 7,400 B. T. U. credited to the engine is equal to the water-heat of the feed at the temperature of the exhaust. In the present case a special credit has to be given to the engine, because 6,750 B. T. U. leave the engine in the jacket water to return to the boiler; but 150 are lost by radiation on the way, so that the net return is 6,600 B. T. U. Only



the net return to the boiler should be credited to the engine, because the jackets are applied to correct a fault of the engine, namely, cylinder condensation; hence any loss to the steam plant that may be entailed by the use of jackets (i. e., the radiation in question) should be reckoned as a loss due to the engine, although it takes place outside the engine. In the case under consideration the jacket water was returned direct to the boiler; but if, as is frequently the case, the jacket water is drained into the hot-well, the heat in it cannot be credited to the engine, for the reasons given above.

plied "per minute per i. h. p." is  $142,150 \div 643 = 221$  B. T. U. and it is this figure which, as recommended in the report, should be used to express the thermal economical value of a steam engine. This recommendation is made with a view of replacing the present usual method of stating the performance in lbs. of feed-water per i. h. p. per hour, although the latter statement is useful for other purposes.

It will be seen that 1,870 B. T. U. are deducted from the 27,260 utilized as work on the pistons, as engine friction, so that the effective or brake power of the engine corresponds to 25,390

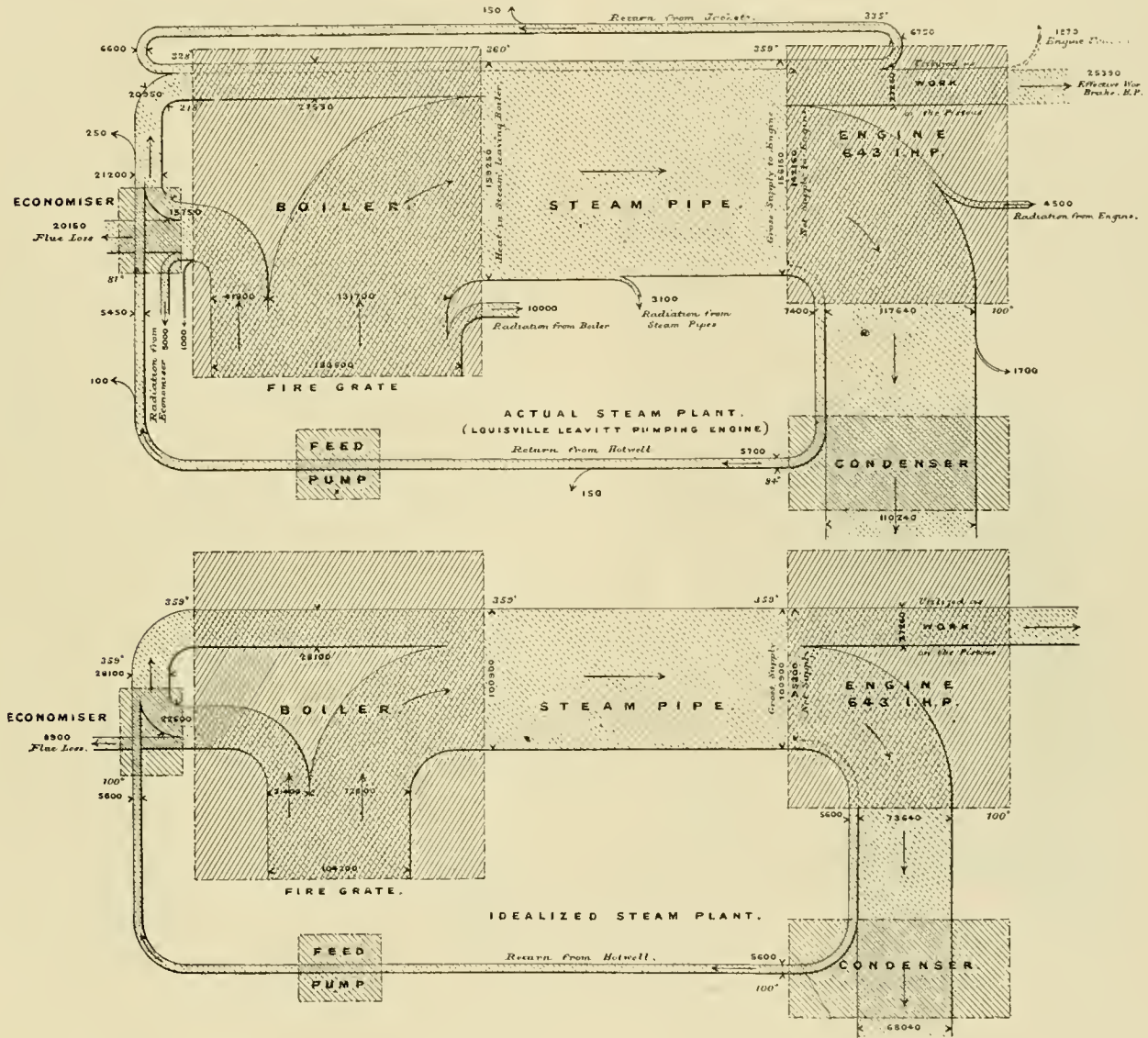


FIG. 1.—THE LOSSES IN A STEAM PLANT.

The net supply to the engine can therefore be obtained as follows:

	B. T. U.	B. T. U.
Gross supply .....	156,150	
Less returnable by feed .....	7,400	
Less return by jackets .....	6,600	
		14,000
Net supply per minute .....		142,150

It will be seen that only 27,260 B. T. U. are utilized as work upon the pistons. The ratio of heat so utilized to the net heat supplied is called in this report the "Thermal Efficiency of the Engine." In the numerical case under consideration the thermal efficiency is  $27,260 \div 142,150 = 0.15$ .

The engine under discussion indicates 643 h. p.; the heat sup-

plied "per minute per i. h. p." is  $142,150 \div 643 = 221$  B. T. U. per minute; in other words, the brake h. p. of the engine is 590, so that the B. T. U. per minute per i. h. p. are  $142,150 \div 590 = 237$ , another figure which the committee recommends should be quoted whenever it is possible to ascertain the brake efficiency.

Let it now be supposed that the actual steam engine is replaced by an ideal steam engine, forming part of an idealized steam plant working according to the "Rankine cycle," using for this cycle the name recommended by the committee. It must be assumed that the i. h. p. of the "ideal" engine is the same as that of the "actual" engine, namely, 643 h. p., and that the admission and exhaust temperature are the same, namely, 350 degrees F. and 100 degrees F. respectively. The flow of heat in the ideal steam plant is represented by the lower diagram, and it will be observed that all the losses have disappeared, except

the flue loss and the heat carried away by the condensing water. There are no jackets, but there is an economizer, because, although the boiler is perfect, 31,400 B. T. U. are sent into the flue, since the gases cannot be cooled down below the temperature of the water in the boiler, and a portion of this heat can be saved by heating the feed to the steam temperature. The heat returnable by the feed is, of course, less than in the case of the actual engine, owing to the reduced weight of steam passing through the engine. The heat supplied to the ideal engine is therefore:

	B. T. U.
Gross supply .....	100,900
Less returned by feed .....	5,600
	95,300
Net heat supplied per minute .....	95,300

The i. h. p. of the ideal steam engine being the same as that of the actual engine, the same number of B. T. U. per minute are utilized as work upon the piston, namely, 27,260. The thermal efficiency of this ideal steam engine is therefore  $27,260 \div 95,300 = 0.285$  and the B. T. U. per minute per i. h. p. are  $95,300 \div 643 = 148$ , as against 221 for the actual engine. The actual engine, therefore, requires 73 B. T. U. per minute per i. h. p. more than the ideal engine; these heat-units are lost on account of imperfections in the actual engine, and can be looked upon as a measure of these imperfections. The ideal steam engine thus becomes the "stan-

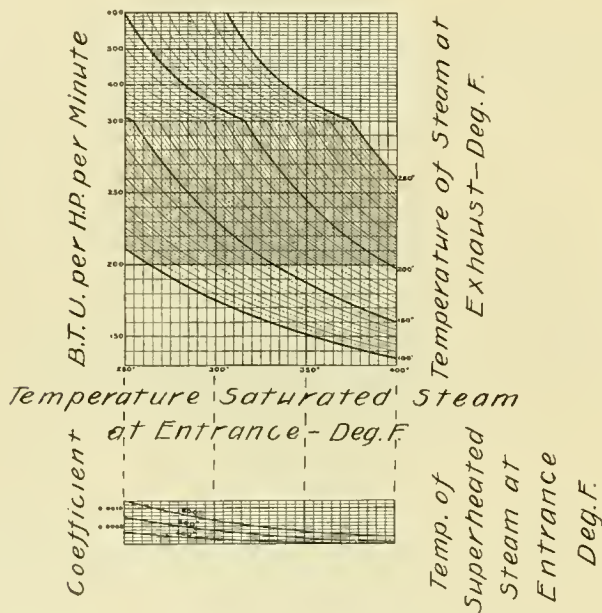


FIG. 2.—FOR COMPUTING B. T. U. FOR IDEAL ENGINE.

dard of comparison," as recommended and defined by the committee.

The number of B. T. U. per minute per i. h. p. required by the ideal engine depends on the temperature of the steam at admission, and its temperature as exhaust, and also on whether the steam is saturated or superheated. Fig. 2 has been drawn to enable this number of B. T. U. to be read off directly in all cases likely to occur in practice.

If the number of B. T. U. per minute per i. h. p. required by the ideal engine be divided by the number needed by the actual engine, there is obtained what has been called the "efficiency ratio" by the committee. In the numerical case under consideration this ratio is  $148 \div 221 = 0.67$ .

For the purposes of comparison an ideal steam engine working as part of the Rankine cycle is recommended.

The definition of the Rankine cycle is as follows: It is assumed that all the component parts of the steam plant are perfect, and that there are no losses due to initial condensation,

leakage, radiation, or conduction, and that there is no clearance in the cylinder. The feed-water required is taken into the boiler at the exhaust temperature, and its temperature is gradually raised until that corresponding to saturated steam is reached. Steam is then formed at constant pressure until dry saturated steam is produced, after which, if the steam is to be superheated, heat is added at constant pressure and at increasing temperature, until the required temperature of superheat is reached. The steam is introduced into the cylinder at constant pressure, displacing the piston, and performing external work equal to the absolute pressure multiplied by the volume swept through by the piston up to the point of cut-off. Beyond that point expansion takes place adiabatically, doing work until the pressure in the cylinder is equal to the back pressure against which the engine is working. The steam is then completely exhausted from the cylinder at constant pressure corresponding with the lower limit of temperature, work being done on the steam by the engine during exhaust, equal to the absolute back pressure multiplied by the total volume swept through by the piston. The steam is thus removed from the cylinder and the cycle is complete.

The recommendations of the committee are summarized as follows:

1. That "thermal efficiency" as applied to any heat engine should mean the ratio between the heat utilized as work on the piston by that engine and the heat supplied to it.
2. That the heat utilized as work be obtained by measuring the indicator diagrams in the usual way.
3. That in the case of a steam engine, the heat supplied be calculated as the total heat of the steam entering the engine less the water-heat of the same weight of water at the temperature of the engine exhaust, both quantities being reckoned from 32° F.

4. That the temperature and pressure limits, both for saturated and superheated steam, be as follows:

Upper limit: the temperature and pressure close to, but on the boiler side of, the engine stop-valve, except for the purpose of calculating the standard of comparison in cases when the stop-valve is purposely used for reducing the pressure. In such cases the temperature of the steam at the reduced pressure shall be substituted. In the case of saturated steam the temperature corresponding to the pressure can be taken.

Lower limit: the temperature in the exhaust-pipe close to, but outside, the engine. The temperature corresponding to the pressure of the exhaust steam can be taken.

5. That a standard steam engine of comparison be adopted, and that it be the ideal steam engine working on the Rankine cycle between the same temperature and pressure limits as the actual engine to be compared.

6. That the ratio between the thermal efficiency of an actual engine and the thermal efficiency of the corresponding standard steam engine of comparison be called the "efficiency ratio."

7. That it is desirable to state the thermal economy of a steam engine in terms of the thermal units required per minute per i. h. p., and that, when possible, the thermal units required per minute per brake h. p. be also stated.

8. That, for scientific purposes, there be also stated the thermal units required per minute per h. p. by the standard engine of comparison, which can readily be obtained from a diagram similar to that given in Fig. 2, and from which the efficiency ratio can be deduced.

Your committee would also suggest that in papers submitted to the institution bearing on steam-engine economy, authors be invited to conform to the above recommendations.

The number of B. T. U. per horse-power per minute for an ideal Rankine cycle may be calculated but the formulas are complicated and the committee prepared diagrams from which Fig. 2 is reproduced, on which the B. T. U. for the standard engine may be read directly. The upper and lower portions of the diagram are drawn to different scales, which fact causes the cusps in the curves.

Numerical examples will make clear the manner of using the diagram. If we suppose the engine uses saturated steam at a temperature of 300° and exhausts it at a temperature of 220 degrees, we take the vertical line marked 300 degrees and follow it up until it cuts the curve corresponding to 220 degrees,



as marked on the right hand margin; from this point of intersection proceed on a horizontal line to the left hand margin and read the B. T. U. required per horse-power per minute, which is seen to be 425.

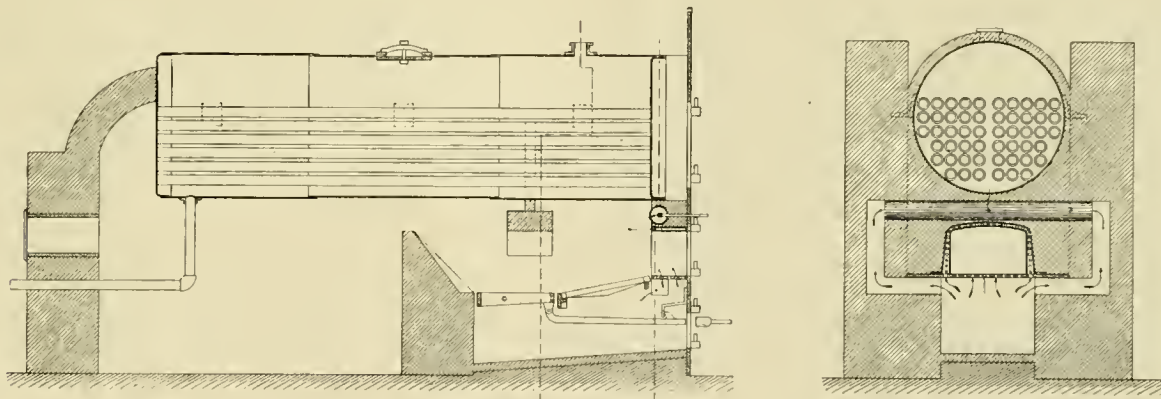
Suppose the steam is at a pressure of 68 lbs. absolute, but superheated to 400 degrees. To find the B. T. U. for the ideal engine, take the temperature due the pressure of 68 lbs., which is 300 degrees F., and the exhaust temperature as before, 220 degrees, and find the B. T. U. from the upper diagram as before. Then on the lower diagram follow the vertical line marked 300 till it intersects the curve marked 400 degrees; follow a horizontal from this point to left hand margin and we find the coefficient 0.00015. Multiply this by the exhaust temperature 220; and then multiply the product by 425, the number of B. T. U. found from the upper diagram. The result is  $220 \times 425 \times .00015 = 14.63$ , which is to be subtracted from 425 to give the B. T. U. per horse-power per minute. The remainder,  $425 - 14.63 = 410.97$  B. T. U. is the number required.

\* \* \*

### The Economical Combustion of Fuel and the Prevention of Smoke.

This subject was discussed by R. L. Walker before the Engineers' Society of Western Pennsylvania, and he presented drawings of boiler settings designed by him with which, it is claimed, the smoke production has been reduced so that it is only from 3 to 10 per cent; that is the chimney is practically smokeless for about 57 minutes per hour.

Mr. Walker believes that the air supply to furnaces is generally too small, the furnaces being designed to admit the weight needed at a low temperature and allowance not being made for the increase in volume which occurs when the gases are heated. A second source of loss and cause of poor combustion results from heating the air in the combustion chamber itself. The problem stated by him is: 1. How to supply a larger portion of air, without resorting to forced draft, as ordinarily introduced, and other



WALKER BOILER SETTING.

methods now in use. 2. How to raise the temperature of this larger amount of air, without too great a loss of heat in the combustion chamber.

To accomplish this Mr. Williams takes the air through holes in the ash pit, or elsewhere nearby, and carries it, by means of ducts, to a point above the fire, and then by means of a deflector arch, introduces the now heated air into contact with the fuel and gases as shown in the drawings.

The deflector arch is located at about that point in the fire box where the distilling process ceases and the consumption of the fixed carbon begins. The fuel is burned to coke in the front part of the fire box and then pushed back to the rear, and a larger supply of air given to it, and green fuel put on in front.

The author cited numerous tests the results of which showed that the setting was successful as a smoke preventor, and economical in fuel consumption. The repairs are also said to be light.

## VENTILATION IN LONDON TUNNEL RAILWAYS.

On the occasion of the return to London of the Guards from the Soudan, last month, a large crowd congregated at the railway station, and immediately after there was the usual rush to get away again. One of the heavily loaded trains on the City & Waterloo underground line became stalled, and to escape suffocation the 300 or more passengers made their way out of the tunnel on foot. This road is scarcely a mile long and connects the Waterloo station with a point in the "city" near the Bank of England; the line dips down from each terminus and crosses under the Thames. There are separate tunnels for the two tracks and they are but little larger in cross-section than the cars. Starting from one terminus the car is carried for two-thirds of the distance by gravity, the ascent at the other end being by electricity. No provision for ventilating the tunnel is made, the car itself setting up a current of air; in this case when the motors were unable to mount the final grade, and the train stopped, the air soon became foul, and the passengers were panic stricken.

## A TROLLEY ACTS AS A CATAPULT.

One of the repair men of the Cicero & Proviso Street Railway Company, of Chicago, climbed to the roof of a car at 48th and Lake streets to make some repairs. He fastened the trolley pole down on the car roof. But in some manner it was released while he was astride of it. What followed can be better imagined than described. The man shot up into the air and after describing a parabolic curve landed head first into a muddy ditch nearly 20 ft. distant. Fortunately the conductor of the car was near at hand and quickly rescued the man from his predicament. After getting the mud out of his eyes, nose, ears and mouth, he found he had escaped with a few minor bruises.

## SERIOUS COLLISION AT PROVIDENCE.

Shortly after 10 o'clock on the morning of October 31, a very serious collision occurred between two electric cars at Providence, R. I. The cause of the accident was the failure of the brake to work, as one car was descending the steep grade on Chalkstone avenue, leading to "Pleasant Valley" from the east, causing it to run past the turnout at the foot of the grade, which was the regular passing point. The second car was descending into the valley from the west, a new house concealing the west-bound car from the motorman until it was too late to avoid the collision, and the cars met at the bottom of the valley.

Both motormen remained at their posts and were badly injured, one probably fatally. There were three passengers in one car and one in the other, all of whom, and also the two conductors, received painful injuries, but it is believed that none of them are fatal.

## LUBRICATION AND THE TESTING OF OILS.

BY G. W. RISSELL, M. E., IOWA STATE COLLEGE, AMES, IOWA.

### PART II.

**Specific Gravity.**—The specific gravity of a lubricant is the ratio of the weight of a certain volume of it to the weight of an equal volume of distilled water at a stated temperature. Owing to the difference in the coefficients of expansion of lubricants and water this ratio varies with the temperature and for convenience the comparison is usually made at 60 degrees F. Specific gravity is also frequently spoken of as density. Oils are usually measured and sold by the gallon or multiples thereof. If the specific gravity be known, or determined for the temperature at which the oil is measured, the weight of the oil may be computed by multiplying together the number of gallons, the specific gravity and the weight of one gallon of water at 60 degrees F. The latter quantity is 8.331 lbs.

The specific gravities of a few oils are given herewith, the data being taken from Thurston on "Friction and Lost Work in Millwork and Machinery," page 188.

#### SPECIFIC GRAVITIES OF OILS.

Vegetable.	Animal.	Mineral.	
Palm .....	Sperm .....	Benzine .....	.651
Rape-seed .....	Tallow .....	Illuminating .....	.800
Olive .....	Neat's-foot .....	Lubricating, heavy .....	.886
Cotton-seed .....	Lard .....	Paraffine wax .....	.890
Linseed, raw .....	Seal .....		.924
Linseed, boiled .....	Whale .....		.925
Castor .....	Cod-liver .....		.927
Rosin .....			.988

Some determinations made by the writer on commercial mineral lubricating oils show specific gravities as follows:

Light Engine Oil, No. 1 .....	.874
Light Engine Oil, No. 2 .....	.873
Medium Engine Oil .....	.877
Spindle Machine Oil, No. 1 .....	.888
Spindle Machine Oil, No. 2 .....	.893
Heavy Marine Engine Oil .....	.894

Average .....

Analysis of these figures brings out the fact that mineral oils as a rule have a lower specific gravity than animal and vegetable oils. Sperm oil is the only notable exception. Therefore, it would seem that the specific gravity test might be used for forming an estimate of the purity of an oil and, together with a knowledge of other circumstances, for judging of the nature of the adulterant. Experience confirms the conclusion. Thus, if an oil purchased for sperm oil shows a specific gravity of .910 (say), the purchaser would know that the oil was impure or not of good quality. Again, a so-called mineral oil having a specific gravity of .930 would surely be heavily charged with linseed, castor or rosin oil. The gumming test would confirm this. In order, however, to detect small differences in specific gravity and to draw just inferences therefrom, the tests should be carefully made and there should be a full knowledge of the other properties of the oil.

#### DETERMINATION OF SPECIFIC GRAVITY.

**1. Hydrometer Method.** The hydrometer is essentially a glass float of such shape, Fig. 1, that it will maintain a vertical position in a liquid when partly immersed therein. Evidently the depth of immersion will vary with the specific gravity of the liquid. As constructed for use with oils, which are lighter than water, the hydrometer sinks only to the bottom of the stem in water, but in oils less of the stem is exposed. The stem is usually about six inches long and is graduated for specific gravities from .700 to 1.000, the latter being for water at 60 degrees F. The scale is proportional and hence can be constructed by placing the instrument in two liquids of known specific gravities. Water is used for the lower mark. Most instruments are provided with two scales one reading in specific gravities directly; the other being an arbitrary scale, known as the Beaumé scale. The latter is useless when both graduations are on the instrument, and should be avoided as confusing and irrational.

To use the hydrometer, fill a tall glass jar with water; hang a thermometer in the water and cool the water with ice or warm it with hot water to bring the temperature to 60 degrees F. Drop the hydrometer gently into the water and note the correction,

if any, for the lowest mark on the scale. This correction must be applied to all subsequent readings. Empty the jar, dry, refill with the oil to be tested and hang the thermometer therein. Set the jar in a larger glass jar of cold water and by the addition of hot water in the larger jar and with constant but not vigorous stirring of the oil, warm the same gradually to 60 degrees F. and read the scale of the hydrometer at the exact level of the oil. Continue to heat the oil and take readings of the hydrometer at intervals of 10 degrees as far as may be desirable or convenient. The reading at 60 degrees is the most important, but the others will be of interest as showing the law of variation of the specific gravity with the temperature. This law can best be shown by plotting a curve, as in Fig. 2. Curves of two samples supposed to be the same oil should be identical. Otherwise the oils are not identical. Furthermore, the specific gravities at 60 degrees F. might be the same, and therefore misleading.

**2. Specific Gravity Bottle Method.** For this method a glass bottle carefully made and adjusted to hold exactly 100 grams of distilled water at 60 degrees F. is filled with oil at the standard or other temperature and carefully weighed on a chemical balance. The ratio of the weights of the oil and water is the specific gravity as per definition. Very exact determinations for temperatures other than the standard would require a correction for the expansion of the glass bottle.

**3. Manometer Method.** This method is carried out with home made apparatus. Procure two glass tubes of equal size, about 3 ft. long. By heating and bending make offsets near one end of each, as shown in Fig. 3. Clamp the tubes to an upright board with a shelf at the bottom to hold two wide mouth bottles. Between the tubes fasten a scale—a yard stick with graduation on both edges of the face will answer. By means of a tee of glass, or metal, and some rubber tube, connect the glass tubes at the top and attach a piece of rubber tube about 2 ft. long, with pinch-cock, all substantially as shown in the sketch. Hang a good thermometer near the apparatus. Fill one of the bottles with the oil to be tested and the other with water. Bring the temperature of the room and the apparatus to as near 60 degrees F. as possible. By suction with the mouth draw oil and water into the respective tubes nearly to the rubber connections. Close the pinch-cock. If the connections are tight the liquids will lower a little and come to rest at such a height that each will



FIG. 1.

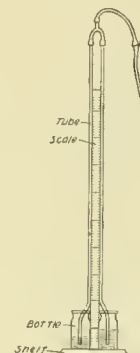


FIG. 3.

balance the portion of the atmospheric pressure which has been removed by the vacuum above. By means of the scale measure the height of each column above the surface of its own liquid. The water column will be shorter than the oil column and the ratio of the heights of the water and oil columns respectively will be the specific gravity of the oil. It is not usually convenient to determine specific gravities with this apparatus for other temperatures than the standard. As far as the cost of apparatus is concerned, this method is in reach of any one and has the very great advantage of being capable of giving very accurate results.



Undoubtedly the hydrometer method is, all things considered, the most useful. The expense for ordinary commercial work need not exceed three or four dollars for an outfit, including hydrometer and jar and a good thermometer. For determining the specific gravity of greases, the bottle method is best. The grease should be heated to fluidity so that when the bottle is filled all air will be excluded. After the grease has cooled in the bottle it will be necessary to add a little to fill the bottle to the mark. For cylinder oils the hydrometer test is conveniently used when the oil is warm enough to be completely fluid.

**Critical Temperature.** The critical temperature of lubricants are the melting or freezing, the flashing and the burning points. A knowledge of these temperatures is often necessary in judging of the suitability or safety of an oil for a designated location or use. Many oils congeal or freeze at temperatures which are only moderately low, and are useless for machinery used in ex-

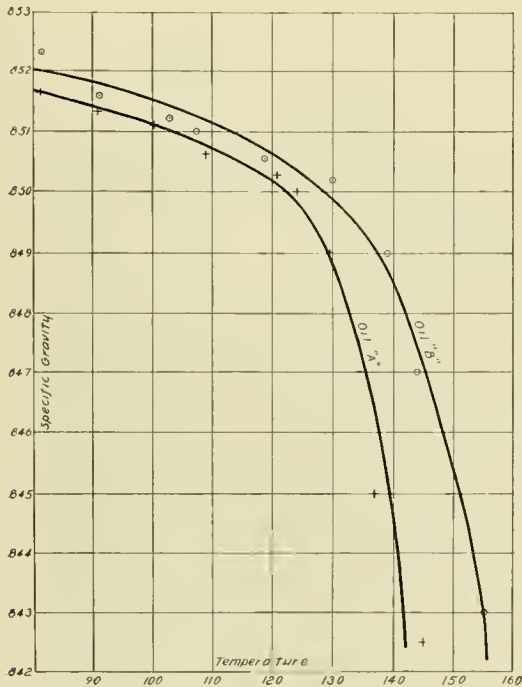


FIG. 2—SPECIFIC GRAVITY—TEMPERATURE CURVE.

posed places in the winter time. On the other hand, the greases owe their usefulness to their property of remaining congealed until the bearings upon which they are used become warm or hot. The best way to determine the freezing point of an oil is to fill with it a wide mouthed bottle fitted with a cork stopper through which passes the stem of a thermometer, the bulb being immersed in the oil. Place the bottle in a freezing mixture or outside on a cold day and leave until the oil is thoroughly congealed. Then place the bottle in a warm place. The oil will gradually thaw out and will become fluid and clear. The temperature at which this occurs is the melting or freezing point.

The flashing point of an oil is the temperature of the oil at which there is given off from its surface an inflammable vapor. This temperature is probably entirely definite, but it is possible by manipulation and choice of apparatus to secure widely varying results for the same oil. What is known as the open cup method gives the best results, and with it there is no special difficulty in securing duplicate results for a given oil. Provide an open tin or copper cup with straight sides, having a capacity of about one pint. Pour into the cup one-half pint of the oil to be tested. Place the cup over a gas burner, or better, on an electric heating disc of high capacity. Hang a thermometer in the oil. Adjust whatever heating agent is employed so as to heat the oil in the cup at as nearly as possible the rate of 50° F. in 15 minutes.

Previous knowledge of the oil or of its class will assist in looking for the flashing point. When the temperature has reached

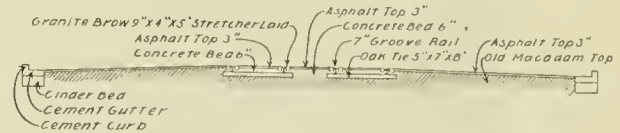
a point about 50 degrees below the supposed flash point a lighted match or taper, or better, a gas jet about the size of a coffee bean should be passed slowly over the cup at about the level of the top of the cup. Do this every two minutes until the vapor which comes from the oil ignites with a short puff or explosion. The temperature of the oil at which this occurs is the flashing point. At this stage the vapor does not continue to burn but can be ignited again and again by the flame. Continue the heating at the same rate until the proximity of the flame causes the vapor to burn continuously.

The corresponding temperature of the body of the oil is the burning point. The vapor then burns close to the surface of the oil and is given off rapidly enough to burn continuously until extinguished in some way. Low flash and burning points are undesirable in lubricating oils, especially for use indoors. Decomposition of the oil is very rapid at these temperatures, whether the oil is ignited or not. Cylinder oils should have very high flash and burning points, especially when used with dry or superheated steam at high pressures. The flash test is of great importance in connection with illuminating oils of all kinds and has an important bearing on insurance problems.

## ROADBED CONSTRUCTION FOR CHICAGO CITY.

Until this summer the eastern terminus of the 35th street cross town line of the Chicago City Railway Company was at Michigan avenue. From Michigan avenue to Grand boulevard 35th street was a part of the South Park system and could not be used for street railway purposes. A petition was signed by the property owners requesting the South Park Board to accept 33rd street as a connection between the two boulevards and thus permit the extension of the 35th street line eastward.

The method of excavating for the roadbed was described in the August REVIEW, page 581. Although the traffic is not heavy on this line the railway construction was made of the most substantial character so that but little in the way of repair will be necessary for many years to come. A cross section of the entire street



SECTION OF ROADBED, THIRTY-FIFTH STREET, CHICAGO.

is here shown. Oak ties, 5 by 8 in. by 7 ft. are laid at intervals of 24 in. and eight spikes are used per tie. Johnson 60-ft. rails weighing 98 lbs. per yd. were used and the joints cast-welded by the company. The Chicago City Railway Company has a complete cast-welding outfit, sand blast, etc., rights having been purchased from the Falk Manufacturing Company.

The company laid asphalt pavement on 35th street from Michigan to Grand boulevard and on this portion of the line 3716 ft. of track was laid with 7-in. grooved "boulevard" rail. The remainder, 3242 ft. of single track, was laid with 9-in. girder rail. This construction is a model of its kind and the whole roadway is as smooth as a floor. The contract for the track work was let to Clift Wise No. 0 trolley wire is used with insulating material from the Albert & J. M. Anderson Manufacturing Company.

The company operating the horse tramways of Exeter, England, has applied to the council for a permit to adopt electricity for traction purposes.

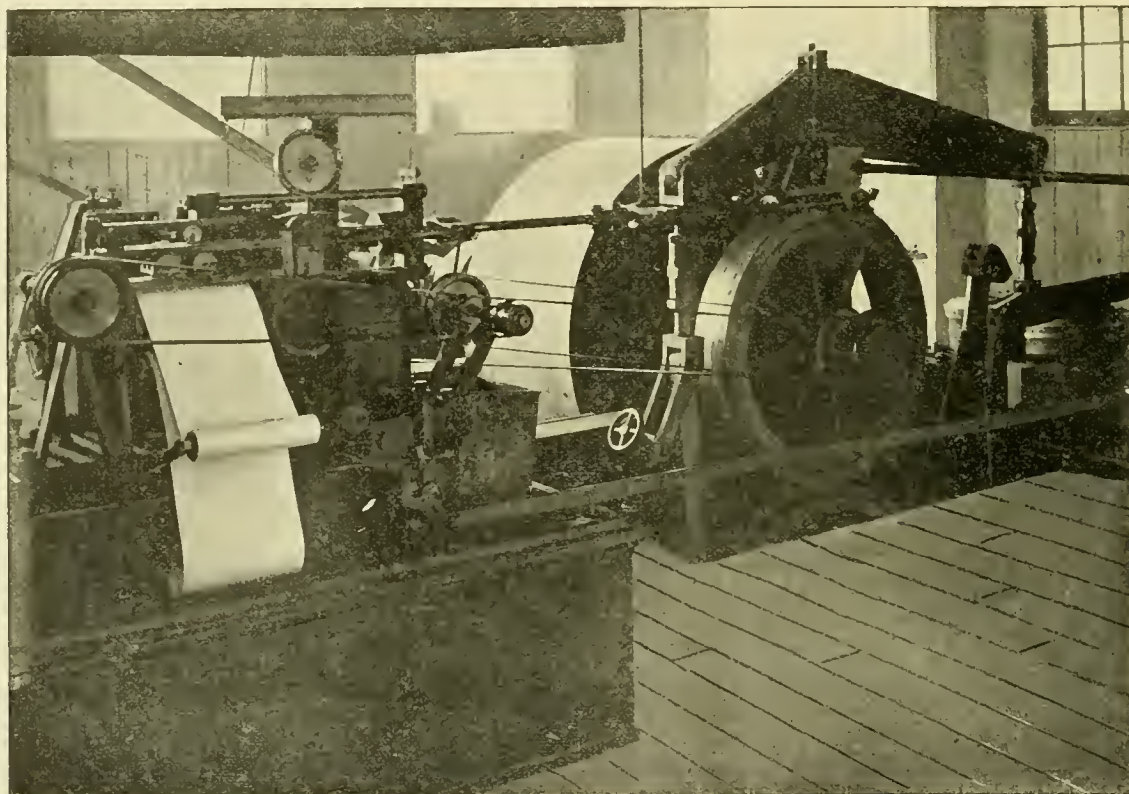
A Dublin, Ireland, paper states that the chimneys for the power houses of the Cork Electric Tramway Company and the Dublin Tramways Company were imported from America. They are of steel and are said to have been riveted and shipped in circular sections. When once on the ground they were very quickly erected.

### THE M. C. B. BRAKE SHOE TESTING MACHINE.

In 1893 the Master Car Builders' Association appointed two committees to report upon brake shoes, one to make road tests and one to make laboratory tests. The latter committee designed a testing machine which, when built, was installed at the works of the Westinghouse Air Brake Company, Wilmerding, Pa., where the tests were conducted. The work of the committee was continued during three years and its reports may be found in the proceedings of the M. C. B. Association for 1894, 1895 and 1896.

The fact that the members of the committee were all men otherwise busily occupied as well as the expense entailed in conducting the tests made it seem undesirable to continue the work at

The brake shoe testing apparatus is shown in the accompanying illustration and was designed to reproduce the conditions of service so far as it is possible to do in laboratory work. A horizontal shaft, 7 in. in diameter, supported in fixed bearings, has keyed on one end a 33 in. car wheel and on the other end a clutch by means of which it may be connected to a jack shaft driven by a double plain slide valve engine with the two cylinders each 10 in. x 12 in. stroke. Secured to the shaft carrying the car wheel is a fly-wheel 48 in. in diameter and 30 in. across the face, built up of cast iron discs and steel-tired to make it secure against bursting. The total weight of the shaft, fly-wheel, car wheel and other revolving parts is 12,600 lbs. and the mass is so distributed that it has the kinetic energy of 11,995 lbs. moving in a straight line with the same velocity as a point on the periphery of the car wheel. Twelve thousand pounds is taken to be the maximum load upon one journal of either a freight or pas-



M. C. B. BRAKE SHOE TESTING MACHINE.

Wilmerding unless a considerable number of new shoes were presented for test, but the committee realized that the prompt testing of new shoes was greatly to be desired both from the point of view of the railroads and of the manufacturers. Accordingly it was recommended that the apparatus be removed to Purdue University at La Fayette, Ind., which the extremely valuable work of Prof. Goss, in locomotive testing had placed at the very front of the educational institutions of the country in railroad work. The Association, at its meeting in June, last, acted upon upon this matter and also decided to remove to Purdue its air brake testing rack, which has heretofore been at Altoona, Pa.

During the summer the brake shoe testing machine was removed and installed in a new building which Purdue University erected for a mechanical testing and railroad laboratory. The only tests made with this apparatus since the summer of 1896 were those conducted for the Sargent Company by John C. Whitridge, M. E., about a year ago, when that company introduced the "Diamond S" brake shoe. We understand that Prof. Goss now has applications from several manufacturers who wish to secure accurate data regarding their products.

senger car and hence the fly-wheel when in motion has the stored energy that in practice is overcome by braking a single car wheel.

Underneath the car wheel is a twin-lever supporting on one end the journals which carry a shaft and wheel. This wheel is steel-tired, the tread corresponding to the profile of the rail head, and by means of weights on the outer end of the twin-lever it may be forced against the car wheel. This arrangement was designed to give the reaction on the wheel that the rail gives in service, but because of the vibration produced, it has never been used in recorded tests.

The brake shoe is applied to the wheel by means of a combination of two levers, to the first one of which the brakehead is attached in such manner that any wear of either wheel or shoe can be readily taken up by vertical adjustment. The desired braking pressure is obtained by suspending weights from the free end of the second lever. The dimensions of the levers make the ratio of braking pressure to the weight used as 24 to 1, and the levers alone are equivalent to 1,233 lbs. weight at the free end. The shoe is keyed to the brakehead as in ordinary practice,



and the latter is connected by rods and yokes while a magnet in circuit with a clock traces a time record from which the initial speed of the shaft is determined. A third pencil connected with the Boyer speed recorder traces a diagram, the height of which is proportional to the velocity of the wheel.

The diagrams made by the registering apparatus show, first, a line traced by a pencil connected to a Boyer speed recorder; second, a line made by a pencil attached to the dynamometer which registers the tangential pull of the brake shoe, corresponding to the stress in the brake hanger; third, a line made by a pencil fastened to the armature of a small pair of electro-magnets, which in turn are in circuit with a clock, so that each half second is indicated by a small break in the otherwise straight line. The record of the Boyer speed recorder is not used in determining the initial speed, but this is calculated from the clock record, as the travel of the paper during the first second can be measured directly. The constants needed in working up the data from the cards are the travel of a point on the face of the wheel corresponding to one inch travel of the paper and the number of pounds pull in the rods, connecting the shoe and dynamometer, corresponding to one inch vertical movement of the second pencil.

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## HONOLULU RAPID TRANSIT & LAND COMPANY.

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In the REVIEW for October, mention was made of the organization of the Honolulu Rapid Transit & Land Company and of the fact that the general manager of the company, C. G. Ballentyne, contemplated a visit to the states for the purpose of obtaining the data necessary to enable the board to ask tenders for material and equipment. Mr. Ballentyne arrived the latter part of last month and reached Chicago early in November; while here he called upon the REVIEW and furnished us some very interesting details concerning the plans and prospects of the new company.

The company and the capital to be employed are purely local. Prior to Mr. Ballentyne assuming the management of the Rapid Transit Company he was the manager of the Hawaiian Gazette Company, the publisher of the "Daily Pacific Commercial Advertiser," the "Semi-Weekly Gazette," the "Kuokou" (a Hawaiian weekly) and the "Planter's Monthly." Besides these several other papers are published for other parties.

The constitution of the Republic of Hawaii was drafted by men who were familiar with the constitutions of Great Britain, Canada and the United States, and as they were careful to avoid the weak spots in these, retaining only what was most desirable, they succeeded in drafting a model constitution.

There only officers elected by popular vote are the members of the legislature. The civil service is not at the mercy of party spoilsmen. The judiciary hold office during good behavior, and it may be mentioned that all of the members of the supreme court are graduates of Yale or Harvard. There are no municipalities, the local government being conducted through the machinery of the Bureau of Public Works, one of the bureaus of the Department of the Interior; in this it is quite probable that the states of the Union might well follow the example of the new territory. "Boodling" is unknown, and legislation is passed on its merits. There is a compulsory system of public education; all residents within the school age, be they natives, Chinese, Japanese, or of Caucasian blood, must attend the public schools, where English is the only language taught.

The franchise of the Honolulu Rapid Transit & Land Company is for the term of 30 years. According to the charter, operating and maintenance charges are first to be paid out of the earnings, then dividends not to exceed 8 per cent on the stock are to be paid, and provision made for a sinking fund to replace the capital and pay the bonded debt, if any, at the end of the term; if there be any excess after these charges are paid, the stockholders and the government will divide it equally between them.

Honolulu has a population of 30,000, but because of the ener-

vating effect of the climate the city is fully equivalent, so far as street car travel is concerned, to any city of 100,000 inhabitants in the states. People will ride, even if they only care to go very short distances, and Mr. Ballentyne estimates that the company will collect 6,000,000 fares per annum. The system of the company will comprise five lines radiating from the business center; the main line, as planned, is to be about 8½ miles long, there is one of about five miles, and the others are from two to three miles in length. A uniform fare of 5 cents, with free transfers at the junction point, is agreed upon. School children under the age of 17 years will be carried for 2½ cents. The old company charges 15, 10 and 5 cents for rides of different lengths.

The average annual temperature in Honolulu is 72 degrees, with a maximum of 86 degrees, and a minimum of 60 degrees, and sea bathing is in season the year round. The company expects that traffic on the lines to Waikiki Beach, the most popular bathing resort, and to the U. S. barracks to be built at Kahauki, will be very heavy.

The company proposes to lay 25 miles of track with 6-in. rails of not less than 70 lbs. per yard, using the concrete bed construction, imbedding the rail completely, except the upper surface. The salt and humid atmosphere quickly corrodes all exposed iron work, and to prolong the life of the rails as much as possible it is proposed to get them with webs at least ⅝ in. thick, and protect them with concrete as mentioned. The joints will be cast welded.

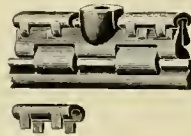
Mr. Ballentyne will remain in the vicinity of New York for at least 60 days and will make his headquarters at the Manhattan, New York.

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## THE BARTLEY MECHANICAL CLIP.

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The Albert & J. M. Anderson Manufacturing Company, 289-293 A street, South Boston, Mass., has just placed on the market a new mechanical clip for figure 8 wire which is shown in the accompanying illustrations. The larger figure shows the clip as attached to the wire; it consists of two interlocking parts which



firmly grip the upper portion of the trolley wire; when closed the clip is held by two of the small clamps, shown in the smaller figure. The upper edges of the two clip parts, when brought together, have a slight taper from the center to either side and are so shaped that they will just enter the grooves in the small clamps. When the clip is in position on the wire the clamps are driven on permanently, fixing the grip of the jaws, the clamp is prevented from slipping back by bending down the fingers on its lower edge to engage the lugs shown on the clip. The lugs are staggered so that some of them are always in proper position to engage the fingers.

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## TROLLEY CAR USED TO WRECK A STRUCTURE.

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The Northwest ball park, on the corner of Paulina street and Clybourn place, has become an eye sore and nuisance to those living in that vicinity. Several attempts have been made to damage the property and portions of the fence and gates have been carried off, and this has been the occasion of several arrests by the police. A crowd gathered one morning with axes and saws to demolish the grand stand. Some bright mind thought that a trolley car would prove a most effective instrument for the work. One of the car barns of the North Chicago Street Railroad Company is just across the street from the park and a motor car was taken out before the employes could interfere. A heavy rope was attached to the car and to the roof of the grand stand. The current was turned on, the rope creaked and the grand stand fell with a crash, much to the pleasure of the crowd, who fell to work gathering up the debris for wood and kindling. Five of the mob were arrested and will be prosecuted.

## THE BUFFALO & LOCKPORT RAILWAY

An enterprise which has attracted considerable attention in street railway circles during the present year is the organization of the Buffalo & Lockport Railway Company and the development of its extensive plans. This company has for its president Hon. W. Caryl Ely, who holds the same office in the Buffalo & Niagara Falls Electric Railway Company, and its general manager is Burt Van Horn, who is general manager of the Buffalo & Niagara Falls road. The wide experience these two men have had in the street railway field in connection with the first road they built enabled them to see the wonderful possibilities in connection with an electric trunk line to connect Buffalo in Erie county and Lockport in Niagara county, two county seats. To accomplish their object they conceived the securing of a long lease of the branch of the Erie Railway between North Tonawanda and Lockport and its transformation from a steam road into an electric line. This they have successfully done, and their work marks the first surrender in Western New York of a steam road to the onward march of electric traction. But in addition to this Messrs. Ely and Van Horn have purchased the Lock City Electric Railroad, the roads of the Buffalo, Kenmore & Tonawanda Electric Railway Company, and the Elmwood Avenue & Tonawanda Electric Railway Company to aid in the perfection of the general plan of improvement in the electric railway service of Niagara and Erie counties.

The Buffalo & Lockport Railway Company was incorporated May 3, 1898, and so great was the vigor thrown into the enterprise that by August 15 the steam road service, both freight and passenger, between North Tonawanda and Lockport, had been supplanted by the electric service, and the electric cars ran into the city of Buffalo. The contract for rebuilding the Erie branch between North Tonawanda and Lockport was awarded to J. G. White & Co., and John A. Wilson was placed in charge of the work of reconstruction. The old Erie track was in fair condition, being laid with 60-lb. rails. A mile of track a short distance out of Lockport was relaid with 80-lb. rail. It is a single track having three turnouts or switches between Lockport and North Tonawanda. The first of these turnouts is a mile west of Lockport, the second six miles, and the third about 10 miles. Two gangs of men were placed at the work of bonding the track, one gang working days, the other nights. The bond used was the 3-in. horseshoe variety with No. 0000 wire underneath the rail. This work occupied about 20 days. The length of track leased from the Erie for 99 years is 13½ miles, and for nearly 12 miles the track is a straight line, affording good opportunities for speed between stations. Excepting for about three-quarters of a mile in the Erie yards at North Tonawanda, where an arm support is used, the trolley wire is strung on a double line of poles, set 88 ft. apart. The tops of all poles are 22 ft. above the rail. The butts of the poles to a height of 6 ft. from the ground are painted black, and the upper part white, presenting a very neat appearance. Along the poles on the north side of the track run three 500,000-c. m. feeder cables. On the south side of the right of way a power transmission line has been built, the Buffalo-Niagara power transmission line being tapped at North Tonawanda. The poles of this transmission line are set 100 ft. apart, the single crossarm carrying three bare No. 0000 copper cables. The insulators used on this transmission line are the same as used on the Buffalo-Niagara Falls transmission line. In the work of reconstruction a construction train consisting of three flat cars, a caboose and an engine, was employed. On the approach of the time of a regular Erie train this construction train easily made a siding to await its passage. On one of the flat cars a six horse power engine was placed to aid in handling the poles. The wire was strung from a boom on one of the cars with considerable rapidity, about five miles being run out each day. Mr. Wilson was well fitted for the work of J. G. White & Co., he having had considerable experience in construction work in the Niagara-Buffalo locality. He had charge of the building of the Buffalo & Niagara Falls Electric Railway, also the Buffalo-Niagara power transmission line.

The total length of track operated by the Buffalo & Lockport Railway Company at present is 29 miles. This consists of 15½ miles owned by the company and 13½ miles leased from the Erie.

The tracks owned by the company are those which formerly belonged to the Lock City Electric Railway Company, the Buffalo, Kenmore & Tonawanda Electric Railway Company, and the Elmwood Avenue & Tonawanda Electric Railway Company. In Buffalo the cars of the Buffalo & Lockport Railway Company run over the tracks of the Buffalo Railway Company. Within a short time the company expects to make the line from North Tonawanda to Lockport a double track road, and it will also build a line from Lockport to the village of Olcott on Lake Ontario, which place is the summer resort of the residents of Lockport. Travel from Buffalo to Olcott is likely to be heavy in the summer. By the purchase of the Lock City Railway, the company secured about 5½ miles of trackage, which makes all the streets in which it is laid terminals of the main line.

Up to the present time the Buffalo & Lockport railway has been operated by Niagara power passed through a sub-station at Lockport, the Buffalo-Niagara power transmission line, as stated, being tapped in North Tonawanda. However, the Niagara Falls Power Company is now erecting a sub-station at Thompson street, North Tonawanda, power from which will aid in the operation of the road before the month ends. This transformer station will also supply the Buffalo & Niagara Falls Electric Railway, which will then, for the first time in its history, be operated entirely by Niagara Falls power from the Buffalo city line to the foot of Falls street, Niagara Falls. Under the present conditions, current is carried at a pressure of 11,000 volts from the Buffalo-Niagara transmission line over the three No. 0000 cables above referred to to the sub-station at Lockport, where it passes into six of the 150-k. w. static transformers, shown in the illustration, in which the pressure is reduced to 350 volts, at which it passes into two rotary converters, of the type shown, where it is changed into direct current at a voltage of 550. These rotary converters are six pole machines making 530 revolutions per minute. The switchboards are well displayed in the illustration, the high tension board to the left being a temporary arrangement. The air blast for the transformers is supplied by a blower driven by a small motor. Short gap lightning arresters placed in the sub-station in Lockport, protect the line. The Lockport sub-station is at the end of the Erie branch, and occupies a room at the east end of the new brick car storage barn, which has a steel truss roof and is of ample capacity.

It must be remembered that when the Buffalo & Lockport Railway Company leased the old Erie branch it was forced to provide for the freight as well as the passenger business. This necessitated a somewhat unusual equipment for an electric road, and in order to meet the requirements of the situation, the company purchased 10 cars and two electric locomotives. The cars were built by the J. G. Brill Company, of Philadelphia. Each of the electric cars is equipped with four motors, of 52 horse power, and has 18 controllers and electric brakes, the brakes working admirably. In color the cars have been painted yellow, following out the style of the cars on the Buffalo & Niagara Falls line. Each car weighs from 20 to 25 tons. In length the combination passenger and smoking cars are a little over 42 ft. over the buffers, and nearly 32 ft. over the end panels. In construction they conform to both the steam and electric road practice. One step leads to the platforms, which are enclosed by rounded vestibules. Folding gates and hinged doors are also provided for the platforms. The windows in the cars are large, affording fine views of the scenes along the line. The main compartment of the cars has 14 reversible back seats, while the smoking compartment has six of the same seats affording accommodations for 12 persons. The seats are of the woven cane variety. The two compartments of this class of car are separated by a partition in which are glass windows at the sides of the sliding door. Electric heaters will be placed in the cars this winter.

The baggage and passenger combination cars are a little shorter than the passenger and smoking cars, their length being nearly 38 ft. The passenger compartment seats 28 people, while the baggage compartment is nearly 12 ft. long, amply large, it has been found, to accommodate the baggage offered for transportation. In the partition between the baggage and passenger compartments there is a sliding door, and on the sides of each car there are sliding doors through which to receive the baggage.

The two electric locomotives of the company have proved the novelty of the road. They are the first to be placed in service

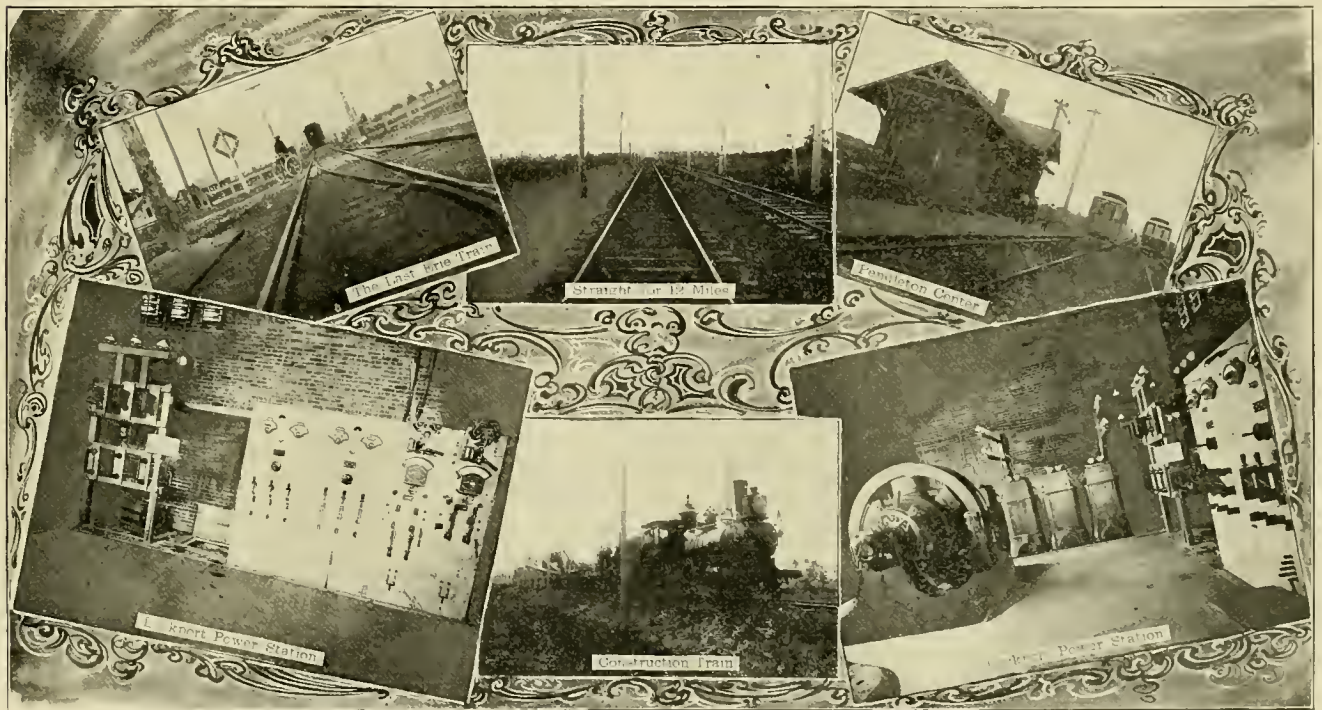


in western New York, and it is this early predicted that the adoption of them will lead to their further use in the Niagara locality. They are of the same pattern as will be employed on the underground roads of London, England. Each locomotive is fitted with four 55-h. p. motors; the weight of each is about 40 tons. The length is 32 ft. while the height of the cab over the rail is 12 ft. The cab is centrally located with a sloping shield on each side. Their guaranteed speed is 15 miles an hour. They have been known to draw 28 cars with good results. When the Erie branch was leased, a heavy freight business fell to the Buffalo & Lockport Railway Company over the line from Lockport to North Tonawanda, where, at the latter place, the freight from Lockport is turned over to the Erie, while freight is also received there for Lockport, one of the electric locomotives making close connections with the Erie trains bringing this freight to North Tonawanda. There is no time lost in the transfer of the cars, and the electric locomotive speeds off down the line with them to Lockport and other stations. It is a novelty in railroading to see the electric and steam locomotives operating in the

handling the freight between Lockport and North Tonawanda or other stations.

Incidentally it may be remarked that the electric locomotives have pneumatically controlled trolleys, which removes the necessity of any of the crew on the locomotive leaving the cab to replace the trolley wheel on the wire or to reverse it, the result in either case being effected by the operation of a handle in the cab. By admitting air into a cylinder, the downward motion is obtained, the piston of the cylinder pressing the spring that holds the pole in place when in use. Both the pole and handle are on a swivel plate, and the upward motion is secured by the spring and the movement to the side by hand. The locomotives are equipped with bell, air whistle, air brakes, sanding arrangement, etc.

Under the management of the Erie the schedule under which the North Tonawanda-Lockport branch was operated gave a total of eight passenger trains, four each way between North Tonawanda and Lockport, the passenger and freight business requiring the service of four locomotives. Under the present



BUFFALO & LOCKPORT RAILWAY.

same yards and over the same tracks at North Tonawanda. A valuable feature of the freight business of this road is that the company has the right under its Lockport franchise to operate its electric locomotives drawing freight through the streets of Lockport between the hours of 11 p. m. and 5 a. m. As yet rail connections have not been made with all the Lockport manufacturing plants it is intended to connect with, but this will be done in the near future, when the freight business will be materially increased. In addition to this the proposed branch to Olcott will probably prove a great freight feeder, as it will pass through a fine farming section, from which much produce is annually shipped, and which has the further advantage for the electric road that the only opposition, or competition, it will meet is the Rome, Watertown & Ogdensburg road over which the train service, at present, is limited. From North Tonawanda to Lockport the right of way is the same as that enjoyed by a steam road, and therefore freight is handled at all times, the sidings, having originally been built for steam road traffic, being amply long to accommodate any train drawn. In the adjustment of the freight accounts between the Buffalo & Lockport and the Erie, the former is allowed a certain percentage of the total freight charge for

schedule of the Buffalo & Lockport Railway Company there are 60 train units, 30 each way, and this excellent service is enjoyed by all parts of the road. Cars are run every half hour between Lockport and Buffalo, the distance being about 25 miles. The run from Lockport to North Tonawanda is made in 23 minutes, while from Lockport to Buffalo the running time is 1 hour and 13 minutes. It is evident from these figures that considerable time is practically lost on some portion of the road, and that point is on the tracks of the Buffalo Railway Company in Buffalo, where the heavy traffic necessitates slower travel. As the cars are capable of making 50 miles an hour, it is evident that the time from terminal to terminal will be reduced to an hour. Not only has the installation of the electric railway resulted in an improved service at the former stations of the Erie, but the half hour service is also afforded to other points on the line, making it highly satisfactory to people along the line, who heretofore could not go to Buffalo and get home before late in the evening. Still another important feature is that the electric cars, by the transfer system, allow people to go direct to their destinations instead of being dropped at a railroad station, possibly some distance from where they desire to go.



The neatness with which traffic is exchanged between the Buffalo & Lockport Railway and the Erie Railway was very well demonstrated during the past summer, when a Lockport fire company desired to go to a Pennsylvania point over the Erie. The sleeping cars to accommodate them were taken from North Tonawanda to Lockport by one of the electric locomotives, and after the company was aboard were hauled back to North Tonawanda and turned over to the Erie. The return was made in the same manner.

On Wednesday, November 2, President Ely had as his guests President E. B. Thomas, First Vice-President George M. Cummings, Second Vice-President W. F. Merrill, General Superintendent Fitch, Superintendent of Motor Power Mitchell and Chief Engineer Buckholtz of the Erie. They arrived at North Tonawanda in two private cars, and there President Ely had an electric locomotive coupled to the cars and taken to Lockport. On arriving in Lockport, the party boarded an electric car and went over the Lock City line, finally returning to their cars and then to North Tonawanda. All expressed pleasure with the trip. The fact that Mr. Ely is president of the Buffalo & Niagara Falls Electric Railway Company and of the Buffalo & Lockport Railway Company makes it possible to run special parties from Lockport to Niagara Falls, or from the Falls to Lockport, the Sunday travel to the Falls in summer being a feature.

To the farmers along the line from North Tonawanda to Lockport, the adoption of electricity as the motive power has been a pleasing innovation, as it removes the danger to their crops by sparks from locomotives.

Although this road has only been in operation two months and a half, its success has been such as to surprise its most sanguine friends. Although the first quarterly statement has not yet been prepared, we are in position to know that the road has paid all operating expenses, a considerable number of tax bills, which really represent other portions of the year, and has nearly earned its first six months installment of interest upon bonded indebtedness, which is payable January 1, 1899.

In his success with the Buffalo & Niagara Falls Electric Railway and the Buffalo & Lockport Railway, Mr. Ely has demonstrated that he is one of the leading electric railway men in the United States. He has been ably assisted by Burt Van Horn.

C. K. Marshall is superintendent of the line, and holds a similar position on the Buffalo & Niagara Falls road.

The old Erie stations along the line between North Tonawanda and Lockport are Martinsville, Hoffman, Pendleton Centre and Hodgeville. The telegraph service is continued.

## JOHN STEPHENSON CAR COMPANY FAILS.

The John Stephenson Car Company, Limited, New York, went into the hands of receivers on October 25, Albert A. Wilcox, of Paterson, N. J.,—a law partner of Vice-President Hohart—and Louis Stein, New York, being appointed under bonds of \$100,000. The company was started in 1831, and is known throughout the world, having always had a large export trade. John Stephenson, the founder and pioneer street car builder, died in 1893. H. C. Valentine represents \$80,000; C. H. Davis \$23,000; J. A. Tackaberry \$14,000, and L. M. Delamater \$13,400 of the present capitalization of \$150,000, which was reduced from \$300,000 in 1875. C. H. Davis has been president for the past 18 months.

The failure caused very general surprise as the Stephenson company was formerly one of the staunchest concerns in the street railway supply field.

The failure is attributed to unexpectedly large outlays in purchase of land and erecting the new works at Bayway, N. J. D. W. Pugh having sold all his stock has retired from the board of directors of which he was a member for 20 years. The hearing to show cause for dissolution has been set for December 6.

L. M. Delamater, the treasurer, states that the company has large obligations falling due in the next four months, aggregating over \$200,000, which it is unable to meet. The company, he states, is engaged in carrying out a number of valuable and important contracts, from which, if completed, considerable profit can be realized, and which will be of benefit to the creditors of the company.

In regard to the assets it is stated that the total amounts to \$1,175,776, the principal items being; cash in banks, \$19,670; cars delivered and finished, \$30,738; car frames up, \$48,059; cars in progress ordered, \$100,335; real estate at Larchmont, \$49,521; real estate in New York city, \$293,000; site of new plant at Bayway, N. J., \$80,000; new plant, \$276,445; new plant, other items, \$87,383; machinery and tools, \$8,951; merchandise, \$152,343. The New York property is at Nos. 429 and 431 East Twenty-fifth street, mortgaged for \$10,000; Nos. 428 to 432 East Twenty-sixth street, mortgaged for \$14,000; Nos. 316 and 318 East Twenty-sixth street, mortgaged for \$15,000, and in Twenty-seventh and Twenty-eighth streets between Fourth and Madison avenues, value, \$250,000, mortgaged for \$170,000. The Larchmont property is mortgaged for \$25,000 and the Bayway property for \$16,000. Total mortgages, \$250,000.

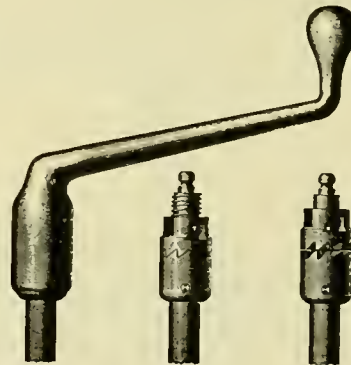
With regard to the liabilities, they are not totalled in the papers filed in court, but they appear to be \$788,782, as follows: Mortgages, \$250,000; notes maturing from now until March 13 next, \$260,000; accounts payable, \$45,867; time bills payable, \$71,207; obligations for goods ordered, but not delivered, \$17,547; bills charged to new works at Bayway, N. J., \$27,957; obligations due on construction account at Bayway, \$116,204.

We are greatly gratified to be able to state that the present difficulties are only temporary and that the company will be re-organized on a firmer basis than ever. It is a source of satisfaction that the name of company will not be changed, thus preserving the name of the Father of Street Cars in the business which his skill and genius built up.

## A NOISELESS RATCHET BRAKE.

The Billings & Spencer Company, of Hartford, Conn., is now making the Kelsey ratchet brake. The design of the ratchet mechanism is such that

there is not only an entire absence of squeaking and rubbing of metal surfaces but there is no wear on the teeth. When the brake handle is turned backwards the upper teeth are raised clear of the lower ones and remain in that position as long as the handle is turned in that direction. When the direction of motion is reversed and the brakes are to be applied a spiral spring forces the teeth



into engagement as is plainly shown in the illustrations. This clutch is superior in strength and durability over the single pawl and ratchet brake. The materials and fittings are of the very best and the surface of the handles which are of composition metal are highly finished.

## LORAIN STEEL COMPANY.

The transfer of the Johnson Company, including its departments for the manufacture of trucks, motors and special track work has been concluded, and the Lorain Steel Company has now become its successor. The change is largely one of convenience and the work, policy and officers of the Lorain Steel remains the same as heretofore. The officers are: A. J. Moxham, president; Tom L. Johnson, first vice-president; Daniel Coolidge, second vice-president; W. A. Donaldson, treasurer; P. M. Boyd, secretary.

The works of the Lorain Steel are not only among the most modern in the buildings and appliances, but have always been most excellently managed.

At the present time additional new buildings are just completed or under construction. It is a large producer of 60-ft. steel rails, for the rolling of which it is the best equipped plant in the country.



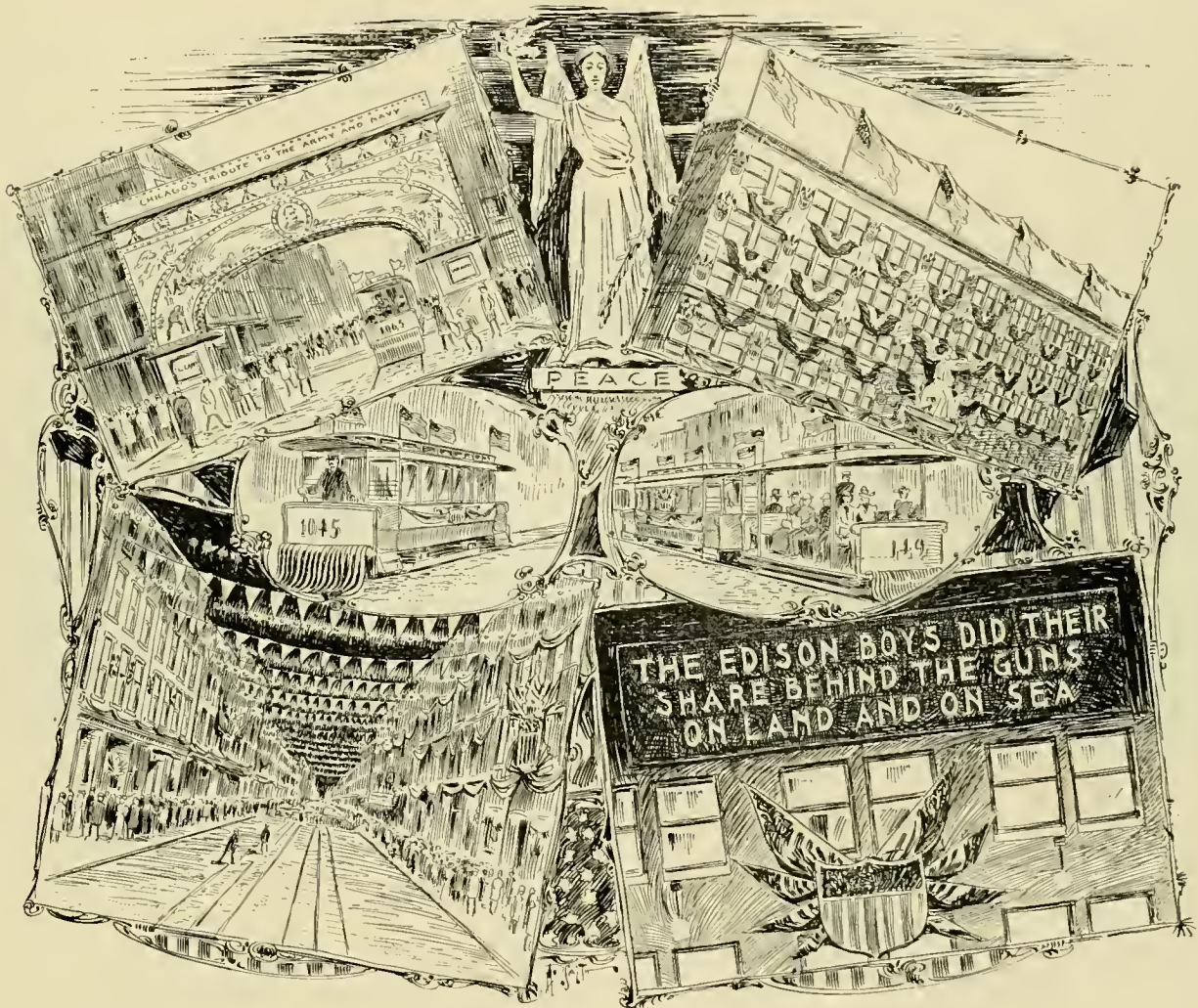
## JUBILEE WEEK IN CHICAGO.

The Peace Jubilee in Chicago, extending from October 16 to 21 was the occasion for a grand celebration and attracted a greater number of visitors to the city than anytime since the World's Fair. President McKinley, with several members of his cabinet, a number of foreign ministers, General Miles, General Shafter and other military and naval officers graced the occasion with their presence.

The great event of the week was the parade of Wednesday for which especial preparation was made. The parade consisted of the distinguished guests of the city, the naval reserve, regulars and volunteers in the late war, the old soldiers and uniformed organizations, numbering in all 10,000.

The Union Loop was adorned with hunting and rows of electric lights wherever the line of march passed beneath the elevated structure. The city arc lamps were placed on the loop in time for the illumination. The elevated road rendered the old arc lamps suspended from poles of little use and the new lamps have been placed on the structure. They are suspended from brackets about 2½ ft. from the iron work. Two lights are at each street crossing at opposite corners. The surface cars were also decorated with the stars and stripes and red, white and blue hunting.

In spite of the inclement weather the railroads brought over 200,000 visitors into the city, and the traffic of the street railway companies was the heaviest in their history. This was especially true of the elevated lines. On the day of the parade the Metropolitan West Side Elevated Company carried 162,000 passengers,



SOME OF THE PEACE JUBILEE DECORATIONS.

The fronts of the buildings along the line of march were decorated with flags, bunting and illuminated signs. These were of many colors and designs. The Chicago Edison Company supplied about 9,000 incandescent lamps for these extra illuminations. Strings of incandescent lamps overhung the principal thoroughfares along which the parade passed. No less than 10,000 lamps were used in this manner. Arches were constructed at the principal corners and suitably decorated with figures, inscriptions and portraits of the naval and military heroes. Some of these were brilliantly illuminated with incandescent lamps, a notable example being the municipal arch, shown in the illustration, and erected by the Chicago Edison Company and two other private concerns.

the South Side Elevated Railroad Company 129,415, and the Lake Street Elevated Railroad Company 75,984, this being an increase of 167 per cent, 160 and 117 per cent, respectively, for the three companies over their average daily traffic. The advantages for the day of the parade were altogether with the elevated roads as all street traffic was suspended in the area bounded by the line of march and consequently the electric and cable lines were unable to operate around their loops. Nevertheless a large business was done on some of the surface routes. The Cottage Grove avenue line of the Chicago City Railway Company alone carried 100,000 passengers during the day. It might be mentioned here that several of the electric lines of the Chicago City Railway are without loop facilities and use the cable car tracks as far down-



town as Van Buren street. At this point they switch over. No less than 100 electric cars an hour use this terminal regularly and do not interfere with the cable trains which are operated on a two-minute headway. The motor cars carry no trailers. On the day of the parade not only the trolley cars but also the cable trains had to be switched over and there were 18 extra trains on the Cottage Grove cable line and 15 on the State street. The time taken in moving the cable cars was very much in excess of that required for the trolley cars, as the grip has to be uncoupled and train switched by horses.

During the three days of heavy traffic the Chicago City Railway carried 900,000 passengers, the West Chicago 800,000 and the North Chicago 500,000, which, together with the elevated roads and smaller lines made a total of 3,000,000 for the three days.

## REPORT OF MONTREAL STREET RAILWAY COMPANY.

The following is taken from the report of the Montreal Street Railway Company for the year ending September 30, 1898. The officers of this company are: President, L. J. Forget; vice-president and managing director, James Ross; secretary, H. M. Watts; manager and chief engineer, F. L. Wanklyn; comptroller, W. G. Ross.

"Your directors beg to submit the statement of the past year's business, showing a net profit of \$601,704.18, as compared with \$507,855.60 for the previous year.

"Out of this amount there have been declared four quarterly dividends of 2½ per cent each, amounting in all to \$429,016.00, the balance of \$138,787.52 being added to the surplus.

"The roadbed, rolling stock and other property of the company have been maintained in a high state of efficiency, the cost thereof having from year to year been charged to operating expenses. Your directors consider it advisable, however, to set aside a portion of the accumulated earnings for the purpose of providing against heavy or special renewals, and they have consequently adopted that policy, establishing an account for such contingencies by transferring \$100,000 from the surplus to the credit of a contingent account.

	1898	1897	1896	1895	1894	1893	1892
Gross Receipts.....	\$1,471,030.65	\$1,342,267.15	\$1,265,598.30	\$1,102,177.51	\$956,000.99	\$750,751.55	\$584,406.57
Increase 1898 over 1897.. 9.62%	120,511.87						
Operating Expenses.....	744,894.25	735,425.60	710,864.70	632,911.74	637,663.14	693,041.71	466,647.98
Increase 1898 over 1897.. 3.62%	28,455.25						
Operating Expenses.....							
Per cent of Car Earnings.....	52.15	55.05	56.48	59.20	71.16	79.00	82.68
Net Earnings.....	707,055.30	606,841.55	555,033.60	469,265.77	318,337.85	157,709.84	97,758.59
Increase 1898 over 1897.. 16.69%	100,113.75						
Net Income per cent. of Capital.....	12.90	12.41	11.55	10.21	9.69	8.12	
Passengers Carried.....	32,353,036	32,047,315	29,896,471	25,872,256	20,569,013	17,377,932	11,631,366
Increase 1898 over 1897.. 10.32%	3,305,721						
Transfers.....	10,000,000	8,705,000	8,541,500	7,058,670	6,828,653	5,994,713	

"It will be noticed by the statistical statement that the company's business continues to increase in a satisfactory manner, and it is also gratifying to note that the percentage of operating expenses shows a further reduction on last year's figures.

"A fire occurred on the company's premises at Hochelaga on the 16th September, destroying a car shed and a considerable amount of rolling stock and electrical equipments. The company's loss, however, was fully covered by insurance, and immediate steps were taken to replace the rolling stock, all of which will be turned out at the company's shops according to the latest standard. In spite of this heavy loss in rolling stock the company's business was done as usual the following day, without inconveniencing the public or affecting the receipts.

"The company's rolling stock has been increased during the past year by the addition of 22 closed motor cars and 60 open motor cars, all of which have been constructed in the company's shops. There are also under construction 40 motor cars, which will be ready for this winter's service, and 75 open motor cars, which will be ready for next summer's traffic. Seven sweepers are also being constructed to replace those destroyed in the fire; also three additional ones, all of which will be ready for service this winter.

"A system of cast-welding of the rail-joints has been introduced, which, judging from the results obtained elsewhere, is calculated to produce a great benefit and also to considerably reduce the expense of track maintenance."

## STRIKE AT LONDON, ONT.

The last week in October a strike was inaugurated on the London (Ont.) Street Railway, of which H. A. Everett is president and C. E. A. Carr, manager. The employes made a sudden demand for an increase in wages of 14 per cent, which the company declined to grant. Some violence has been indulged in by the strikers. We understand that by the terms of the charter the company can employ only residents of London, and that a failure to run cars for two consecutive week days will cause a forfeiture. The city seemed to be adverse to furnishing proper police protection to the company.

## NEW PUBLICATIONS.

The "Railway Master Mechanic," of Chicago, has just issued a fifth edition of "Soft Coal Burning," by C. M. Higginson. It is a pamphlet of 18 pages in which the author notes the results of methods and experiments covering a long period, and describes the various constructions which have been successfully used with economical results. This work has long been considered an authority on the subject, and the fact that this is the fifth edition that has been published is evidence that the demand for it still continues.

The illustrated circulars issued by the Westinghouse Electric & Manufacturing Company from time to time have an educational as well as a commercial value. The latest pamphlet is "Electric Street Railway History, Part I." In this the early types of street railway motors are briefly described and illustrated, and an account of the development of the motor from No. 1, introduced in 1890, to the present type; many of the essential improvements have been made by the Westinghouse engineers. Railway generators and apparatus for an alternating-direct current system of railway power transmission are shown. Circulars 57 and 58 set forth the good features of the long burning enclosed arc lamps for direct and alternating current circuits, made by the Westinghouse Company.

The Wier Frog Company, of Cincinnati, O., has just issued its catalog for 1898-99; it is known as No. 5. The book is bound in cloth and comprises 323 pages, with many illustrations of the frogs, switches, crossings, signals, electric interlocking apparatus, etc., made by the company. This catalog differs from previous editions in the arrangement of the matter; with a view to simplifying the catalog, and making it easy to find all the kinds of a given article made by the company, divisions into groups are made. Under "Stiff Frogs" are found the stiff frogs for all sections of rail, and similarly for "Spring Frogs," "Crossings," "Switches," "Switch Stands," "Rail Braces," "Electrical Interlocking," etc. The figures are numbered as in previous editions, and in addition they are given new numbers with letters indicating the group. There are also valuable tables giving bills of materials for ties, rails, joints, etc., and a list of the rails, 58 in number, carried in stock by the Wier Company, in addition to the A. S. C. E. standard sections. Probably the most interesting products illustrated are the new tongue switches and mates, and girder rail frogs, all with hardened wearing parts.



## PAINTING BY COMPRESSED AIR.

By J. L. Johnson, Master Painter, Denver City Railroad.

Telling a story may, in some cases, be an easy task, but when a person attempts to tell on paper how a viaduct was painted red with a spraying machine and at the same time have his readers understand that he was not "painting the town" it may, very justly be considered as a bird of another color. However, the feat has been accomplished and we think, as we look back, that there are very good reasons for congratulations on the success that has attended the efforts in this case. Particularly so, as this was, so far as we are able to learn, the first attempt in the west to paint a viaduct by the use of compressed air.

The painting of this structure was like very many other things, inasmuch as there were a number of difficulties to be encountered at the outset. A few things that might be mentioned were its length, which was about 5,000 ft., with an average height of 27 ft., and a width of 25 ft. This alone would be no slight undertaking, but in addition to this are these facts, that at the extreme west end the Platte river was crossed, and at the east end were the tracks of the Denver & Rio Grande Railroad, with its numerous switches, the Denver, Lakewood &

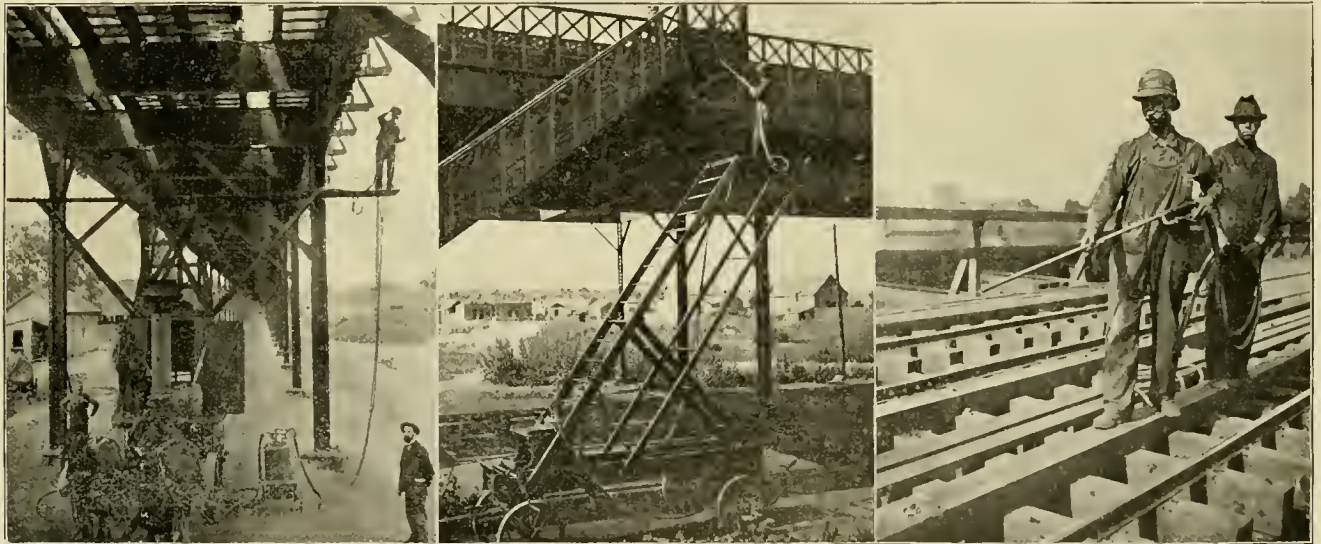
and on the other side was a water tank with a capacity of three barrels.

A spraying machine, which was the invention of W. O. Quest, of the Pittsburg & Lake Erie Railroad, was selected to do the work, and with a force of three men the work was commenced.

The moving was accomplished during the earlier part of the work by laying planks and the use of levers on the rear wheels—no horses being used—but later it was thought more practical to lay gas pipe from the compressor and avoid continuous moving of the boiler and tower, using 100 ft. of pipe and a light scaffold, which was lifted by means of a sliding frame and windlass. The air and paint tanks always being kept directly under the operator of the nozzle.

A 50-ft. length of hose was found to be most practicable, there being no difficulty in reaching any part of the work with that length.

The structure had been given one coat when it was built, and this, after weather beating for so many years, was very porous, and in a bad condition generally. The timbers, and in fact all the wood, were in the same rough condition as when it left the saw mill. The iron, while not deeply rusted, was scaling in many places and rough. Such surfaces, to say the least, could



PAINTING DENVER CITY RAILWAY VIADUCT.

Golden Railroad, the Colorado Midland Railroad, and the Denver, Leadville & Gunnison Railroad.

Considering these dangerous obstructions, a swinging scaffold was naturally suggested, but such a thought could not be considered, as it was entirely too slow. Under these conditions a scaffold on wheels had to be improvised. This was accomplished by first building a strong platform over a portable 12-h. p. boiler. Thus having a firm base, a tower was built which reached 21 ft. from the ground, or as high as could be drawn under the lower steel stringers of the viaduct. At the top of this tower were attached portable wings in such a manner that the whole could be moved under the central part of the work to be painted. After passing each set of pillars with their braces, these wings were lifted to a horizontal position and by being properly secured, formed a continuous scaffold 28 ft. in length by 3 ft. in width. On these wings was a light railing to afford safety and assurance to the operator of the nozzle.

The bottom of this tower was boarded up for a distance of 6 ft. and then was covered, thereby forming a storage room for paints, oils, tools, etc., for the spraying machine when it was not in use. Under this platform, and attached to the boiler, was a coal bunker and a 6 in. x 6 in. Marsh air compressor, made by the Battle Creek Steam Pump Works, of Battle Creek, Mich.,

have boded no good for a brush. Under these conditions it would seem that not only from a financial standpoint but also from superiority of results attained, the decided preference is with the sprayer.

The machine was put in operation on June 29, and the work was completed on September 26. Allowance must be made for five stormy days and 13 Sundays, making the actual working time 67 days. During that time 5,400 lbs. of iron oxide (Rawlins) and 25½ barrels of oil were used.

On this particular class of work there is in almost endless number of places that are very difficult to reach with the brush, even by the tedious process of scaffolding, which was completely forgotten as the sprayer, with its 4-ft. nozzle gave a reach of at least 10 ft. more than could be made with a brush even with the use of a "man-help." In consideration of the most thorough and effective way that all crevices, holes, joints and roughness have been filled, and that these things are the bane of the paint brush, as well as the painter, we are compelled to vote the spraying machine a success, although it is in its infancy.

In conclusion we will add, however, that the man who fancies he can run a paint machine at sight had better ask his friend how to swim and then jump in the water and see how surprised he will be.

## LOOP FOR THREE CHICAGO RAILWAYS.

The West Chicago, the Chicago General and the Ogden Street Railway Companies have united in the construction of a loop at 22nd street, Ogden avenue and West 40th street to facilitate the movement of cars and the transfer of passengers at that terminus of the three companies' lines. A triangular section of ground was purchased in order that curves could be most advantageously placed. Heretofore the cars of each company have been run to this point and switched over.

There are a large number of passengers from suburban towns who change cars at this point taking the West Chicago to the center of the city and the Chicago General to the factory district.

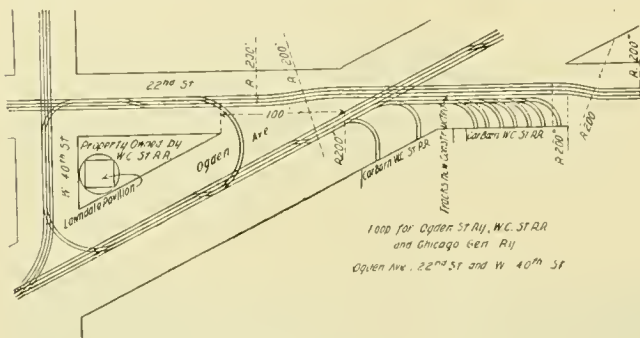


FIG. 1.

The streets were poorly paved and the transfer of passengers involved a passage of a block of bad walking in the change. By means of the new loop, street paving and a transfer station the terminal facilities will be greatly improved both for the company and its patrons.

The cars on the Ogden avenue line of the West Chicago Street Railway Company have a headway of two minutes during the busy portion of the day; those of the Ogden Street Railway Company run on a schedule of seven minutes, and those of the Chicago General about the same. The pavilion, to be constructed in the spring, will not only have waiting rooms but provision will be made for refreshment and lunch rooms for which concessions will be let.

The track work required for the loop involved an outlay of

about \$10,000. The Paige Iron Works, of Chicago, took the contract for the special work and has been very successful in carrying it out. The two diagrams show the general arrangement of the curves. The curves to the West Chicago car barns are also shown in Fig. 1. In Fig. 2 the dotted lines indicate the straight track laid by the track department of the West Chicago

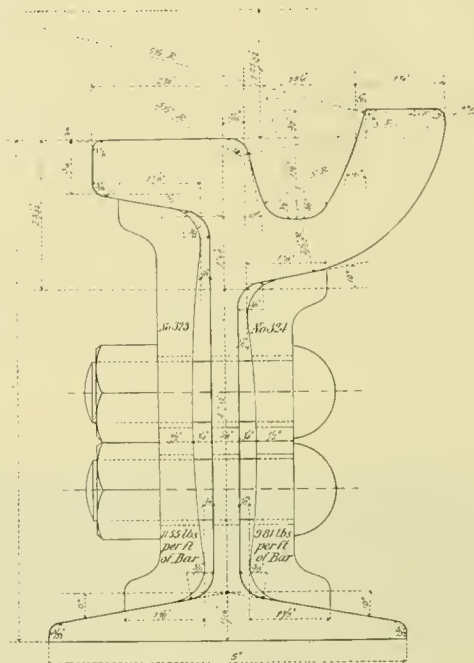


FIG. 3—RAIL FOR SPECIAL WORK.

Company, and the full lines represent the special work constructed by the Paige Iron Works.

For the straight track work a 7-in., 85-lb. grooved rail was used. A grooved rail, of the proportion and size shown in Fig. 3 and made by the Cambria Iron Works, was used for the special work. The curves are three centered with radii of 80 and 55

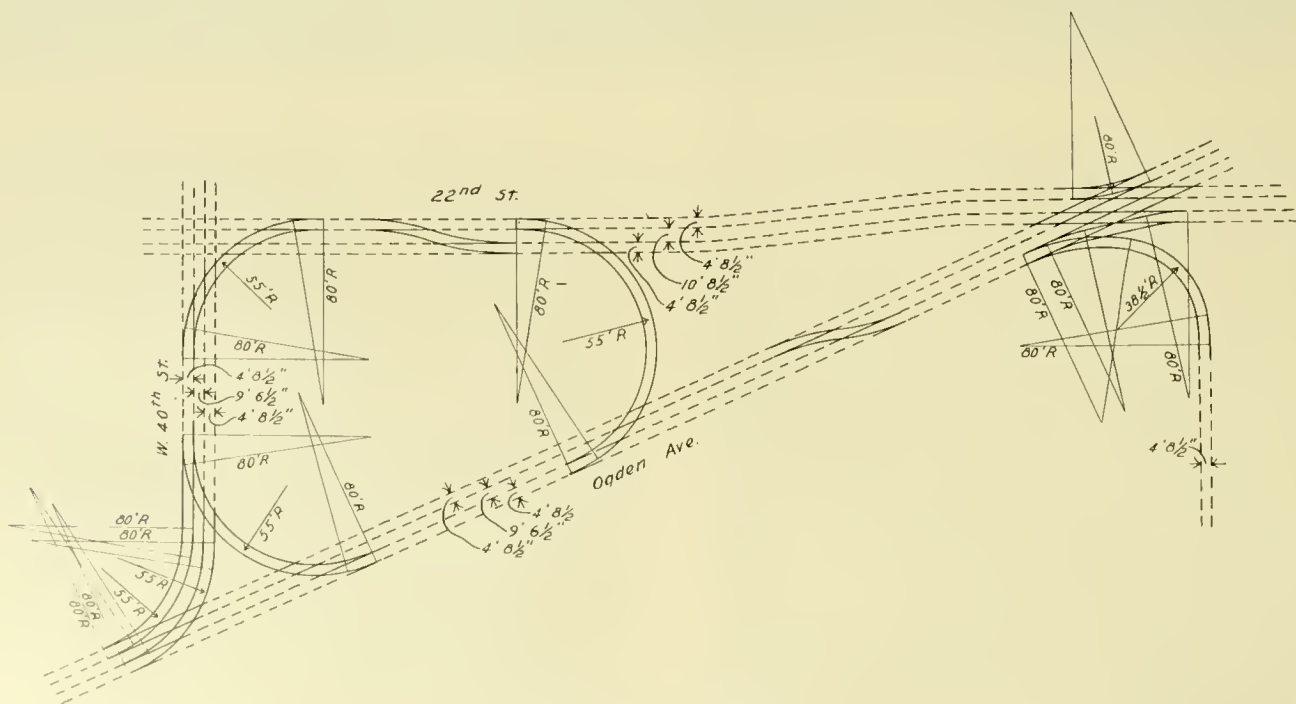


FIG. 2—SPECIAL WORK.



ft., as indicated, and of the standard bolted construction of the Paige Iron Works. The standard gage is widened to 4 ft. 8 $\frac{3}{4}$  in. on the curves and a 100-lb. guard rail is placed on the inside and outside of the curves. Ordinary 80-ft. radius tongue switches are used. The joints are connected by six-bolt splice bars. On the straight portion the tracks are 9 ft. 6 $\frac{1}{2}$  in. between

## PERSONAL.

Mrs. Dr. Fletcher Douthitt, formerly Miss Anna Mitchener, is still managing the Tuscarawas (O.) Street Railway.

George H. Shaw, general manager of the Madison (Wis.) Electric Railway Company, called on the REVIEW when in Chicago recently.

C. F. Holmes, superintendent of the Metropolitan Street Railway Company, Kansas City, Mo., recently returned from an extended eastern trip much improved in health.

George H. Davis, general manager of the Canal & Claiborne and the New Orleans & Carrollton Railroad Companies, was married to Miss Katherine McGrath, of New Orleans, on September 29.

Frank N. Phillips, president of the American Electrical Works, was married to Miss Edith R. Peck, at Providence, R. I., on November 15. The REVIEW joins the host of Mr. Phillips' friends in extending congratulations and best wishes.

Israel A. Kelsey has been elected president of the Middletown (Conn.) Street Railway Company, in which he is a large stockholder. Mr. Kelsey has not retired from the Winchester Avenue Railroad Company, West Haven, having been elected vice-president and secretary.

Robert A. Byrns, formerly with the Walker Company, representing it at Buffalo, is now the eastern representative of the Ohio Brass Company, with headquarters at 36 Cortlandt street, New York. While with the Walker Company Mr. Byrns was very successful and his many friends feel confident of his continued prosperity.

Captain De Ronde, general manager of the Standard Paint Company, New York, is recovering from his long illness incurred in camp, and is now able to come to the office for a few hours each day. He is steadily though slowly recovering, and we join with his numerous other friends in wishing him quick and complete recuperation.

Horace B. Parker, president of the Newton & Boston Street Railway Company, is also adjutant of the 1st Massachusetts heavy artillery. He left Boston for Fort Warren on April 25, and did not return until October 5; on both occasions the weather was stormy, but in spite of the weather the regiment was greeted with great enthusiasm on its return.

George J. Cooke, superintendent of underground construction of the Toledo Traction Company, is suffering from throat trouble and has been allowed an extended leave of absence for the winter, which he will spend in California. Mr. Cooke, although a young man, has made a brilliant record in his underground work in Toledo, where all wires except the trolley wire must be buried by 1900 in the business district of one mile square. The work already accomplished is very creditable and the improved appearance of the street is marked. Mr. Cooke will return in the spring and continue his work.

Colonel J. F. Frazier, a wealthy capitalist of Anderson, Ind., and the promoter of the proposed electric line between Lexington and Georgetown, Ky., died in Georgetown on October 30 of Bright's disease.

La Societa Italiana di Elettricit a gin Cruti is the title of a company which has just been formed in Turin, Italy, with a capital, it is said, of \$500,000. This company will shortly be in the market for all the necessary requirements of an electric railway of the overhead conductor system, which it is to construct between Oreglia and Ormer. It will also early next year invest in several electric light plants. For all its undertakings bids will be asked from foreign manufacturers.



FIG. 4.

centers. Oak ties are laid throughout. Two cross-overs are placed as shown in Fig. 2 to provide for any accidents on the loop.

All the cars of the three lines use the outer tracks, the cars of the West Chicago and the Chicago General companies passing around the curves at the base of the triangle and the cars of the



FIG. 5.

Ogden company turning on the curve in the interior of the triangle. Figs. 4 and 5 are general views of portions of the loop, one of which shows the car barns of the West Chicago Street Railroad Company. The work has been under the general supervision of W. F. Carr, engineer and road master of the West Chicago Company, and much of the credit of the work is due to his designs.

## THANKSGIVING DAY RATES.

Agents of the C. H. & D. will sell tickets for the above occasion at the rate of one and one-third fare for the round trip, to all points within a radius of 150 miles.

Tickets good going on November 24th; good to return including November 25th.

## CHANGES IN THE SOUTHWEST MISSOURI.

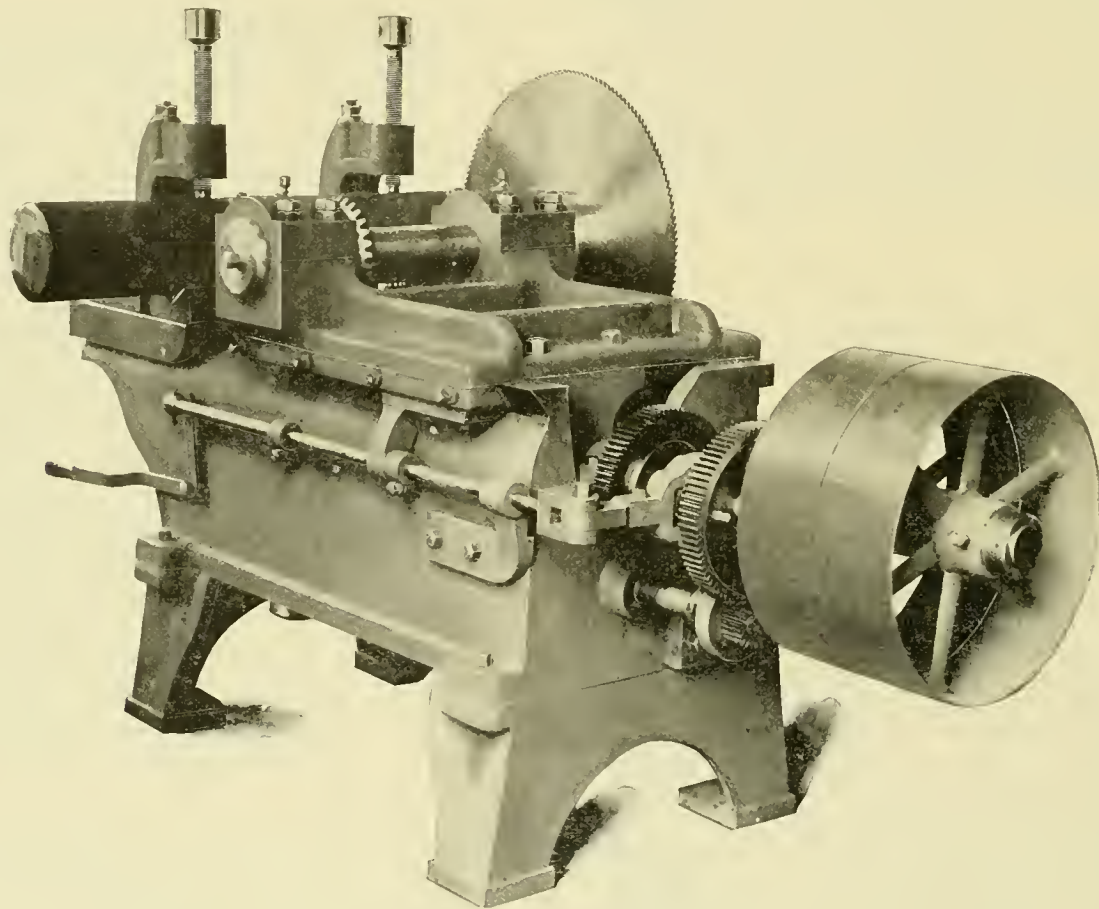
The Southwest Missouri Electric Railway was built in 1893 to connect Joplin, Webb City, Cartersville and Prosperity, all Missouri towns, in the lead and zinc district and in 1894 served a population of about 18,000. In 1896 a consolidation was effected with two other electric railways, the Jasper County Electric Railroad built from Carthage to Webb City in 1895, and Joplin & Galena Electric Railway built in 1896 from Joplin, Mo., to Galena, Kan. After the consolidation this road was 33 miles long and was probably the longest interurban electric road under one management. The population served at the present time is about 60,000.

The property has always been a paying one and not withstanding the most severe steam road competition during the last year, resulting in cut rates, the receipts were almost as great as the

Fred H. Fitch, who has been superintendent of the Southwest Missouri since August, 1896, resigned last September shortly before the change in control of the road, in order to come to Chicago and superintend the construction of the General Electric Railway. He has been succeeded by Mr. Paul, formerly superintendent at Aurora, Ill.

## NEW POWER SAW.

The Q & C Company, of Chicago, has just placed on the market a new and special cold saw with a blade 25 in. in diameter and  $\frac{1}{4}$  in. thick, which is provided with fine teeth. It is known as the Q & C power sawing machine No. 11 and is designed for cutting rails, bar iron, shafting, etc., ranging in size from 3 in.



Q &amp; C POWER SAWING MACHINE NO. 11.

previous year when there was no such competition to meet. The passenger receipts for 1897 were \$118,000. The St. Louis & San Francisco Railroad which runs to all but one of the towns on the Southwest Missouri, about a year ago cut its rates and put on more trains so that there was an hourly service on a portion of the line and trains every two hours on the rest. The maximum rate of fare had been 40 cents, with lower rates to intermediate points; all rates above 10 cents were cut to 10 cents, and the 10 cent rate to 5 cents.

To meet this the Southwest Missouri reduced all its fares to 10 cents, making no cut in the 10 cent rate. Its receipts under this severe strain only fell off \$3,000 being \$115,000 in 1897.

Control of the company after the consolidation in 1896 was held by Carthage, Mo., capitalists until October 12, 1898, when it passed to Joplin, Mo., and Harrisburg, Pa., capitalists. The present officers are: A. H. Rogers, Joplin, president, general manager and treasurer; E. Z. Wallower, Harrisburg, Pa., vice-president; A. G. Knisley, secretary.

to 8 in. round or square. The machine weighs 3,000 lbs. and occupies a floor space of  $2\frac{1}{2}$  by 7 ft. The speed of the saw blade is 11 r. p. m. and the cutting speed is 7-16 in. per minute; the power required is from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  h. p.

A series of tests in cutting steel rails were recently made on one of these machines, the result showing 160 cuts with scarcely any perceptible dullness of saw blade, indicating the large amount of work that can be done without stopping to grind, and showing, as well, the long life of saw blade under the proper conditions of care and handling. The machine has an automatic quick return carriage which economizes time.

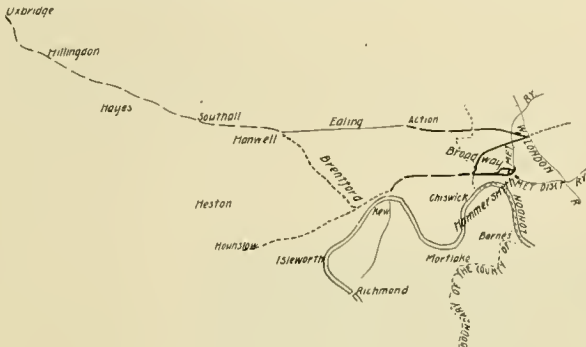
The blades used can be re-sharpened when necessary, a special automatic grinder being furnished at small additional cost, which is not only adapted for doing this work rapidly and accurately, but will work equally well on all kinds of blades used for metal cutting. The automatic grinder is a very valuable device in itself, and although furnished with the power sawing machines when desired, it is also sold to the trade separately as well.



## LONDON UNITED TRAMWAYS.

We have received a copy of an open letter addressed under date of September 27, to the clerk of the London County Council by J. Clifton Robinson, managing director and engineer of the London United Tramways, Limited, in which the writer urges the advantages of equipping the city ends of that company's lines with the overhead trolley.

This company is now operating nearly 7½ miles of horse tramways, of which 4½ miles are within the county of London, as shown by the solid lines in the accompanying map. Electric traction on the overhead trolley system has been authorized on these lines (to Acton and Kew) outside of the county of London;



LINES OF THE LONDON UNITED TRAMWAYS.

these are indicated by the long dash broken lines. An overhead trolley line from Hanwell to Uxbridge has been authorized under the Light Railways Act; this is about 7¼ miles long. A proposed extension (also overhead trolley) is a line from Acton to Hanwell, 2.9 miles. There are tramways (shown by short dash broken lines) to connect Kew with Hanwell and Hounslow now authorized and building, which aggregate 6½ miles. A horse line 1½ miles long connects Kew with Richmond.

Mr. Robinson states in his letter to the London County Council that the light railway to Uxbridge and the extensions mentioned, nearly 20 miles, will be put in operation with electricity for the motive power by June, 1899. Permission is sought to use the overhead trolley on the three short sections under the jurisdiction of the Council, and is urged because: (1) the House of Commons committee is in favor of the system; (2) the public will be seriously inconvenienced by the break in the method of haulage at the city termini; (3) the company agrees to adopt any newer invention proving more efficient, economical or acceptable when the Council shall require it.

## FOR TRAVELER'S COMFORT.

The Boston & Albany's experiment with sprinkling its roadbed with non-flammable and practically odorless oil seems to be highly successful. It costs \$150 a mile to sprinkle the roadbed and after one sprinkling it should be free from dust for a year at least, and when it becomes necessary to treat it again the cost will be much less. In addition to doing away with the dust, the oil sprinkling keeps the rain from washing away the roadbed, destroys vegetation, prevents frost from penetrating and injuring the roadbed, lessens the noise of trains and by preventing dust, reduces the danger of hot-boxes. It makes traveling more agreeable and if it is found as successful in every way that it now seems to be, it will certainly be adopted by other roads.

There are unconfirmed rumors current as to the consolidation of the street railway companies having lines in Chicago south of 63rd street. According to one recent report a new company is to be formed which will acquire the lines of the Calumet, the South Chicago City and the Chicago Traction (the storage battery line), all of which have their northern termini at 63rd street. Another report is that the Chicago City Railway will absorb the three smaller roads.

## FRANCHISES FOR ATLANTA RAILWAYS.

The report of the council committee on electric railways of Atlanta recommends that franchises be granted to the Atlanta Street Railway Company for constructing a complete cross-town system by extending its lines from Grant park through West End and West Atlanta to the center of the city, also franchises for the Atlanta Consolidated Street Railway Company to extend its line to West Atlanta. These lines are important additions to the two systems and will go far in giving Atlanta a complete system of traction.

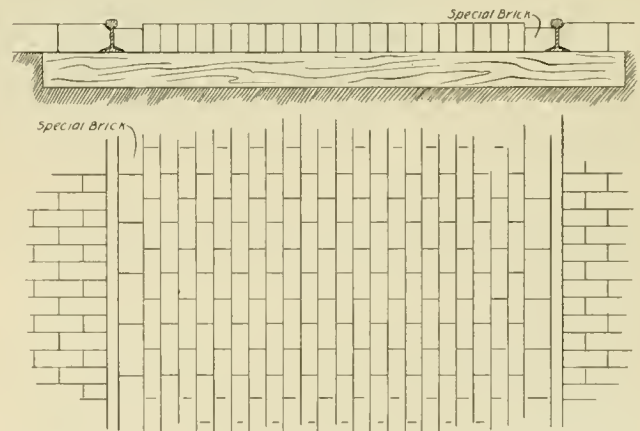
## COLLISION AT WILLIAMSPORT, PA.

About 7 a. m. on October 29, a head-end collision occurred between two electric cars at Williamsport, Pa. The regular car had stopped on its switch to let two cars carrying employes of the silk mill, and known as the "silk mill specials," pass. Owing to the fog the motorman of the waiting car thought that both cars had passed, when in fact but one had done so; when he pulled out the car struck the second special about 100 ft. from the switch. The second car was moving slowly and was stopped by the motorman as soon as he saw that there was something approaching through the fog. The motorman of the moving car was the only one injured; both legs were so badly crushed as to make amputation necessary.

## SPECIAL BRICK FOR PAVING BETWEEN TRACKS.

In laying some new paving Judd Seacord, superintendent of the Galesburg (Ill.) Electric Motor & Power Company, designed a special brick for the work and modified the standard method of placing the brick. The brick laid next to the rails are 3 in. wide, of ordinary thickness and beveled as shown in cut. Next to these are placed paving brick parallel to the track. The space between the rails is just filled by 22 brick placed on edge together with the two rows of special brick. The T-rails weigh 60 lbs. to the yard.

The advantages claimed for this form of construction are: 1.



It requires but one layer, a smaller number of brick is used. 2. It requires no batting and thus saves brick and time, so that a man can lay at least a third more brick in a day. 3. Carriage wheels next to the rail do not pull up the ends of the brick. 4. The brick do not settle so badly between the ties as when placed in the customary manner.

The city authorities objected to this method of laying brick, but gave the street railway company a permit to lay one block of such pavement on trial. After a test the street railway company was requested to hereafter lay all its paving in the manner above described.

## ECHOES FROM THE TRADE

The Chattanooga (Tenn.) Rapid Transit Company has recently purchased six motors from the Westinghouse Company.

The Camden & Suburban Railway Company recently placed an order with the John Stephenson Company, of New York, for seven cars for the Merchantville line. They are to be double truck cars 26 ft. long.

The Electric Railway & Manufacturers Supply Company has been incorporated in San Francisco with a capital stock of \$56,000. The directors are W. S. J. Bourne, S. H. Taylor, Frank Frisbee, H. P. Bowie and H. S. Hagan.

the agent was nicely exhibited in the parlors of the Hotel Jermyn, and attracted much attention and favorable comment. Mr. Morris was assisted by Mr. Harrington in entertaining the visitors and delegates.

F. E. Homer & Co., electrical machinists of Cleveland, O., are widely known as the quick repair house for commutator work. They have exceptional facilities for building and refilling commutators and assembling segments ready for placing on the shell. They make use of commutator bars of the purest copper, drop forged, roll drop, hard drawn or tempered to suit customers, and the best mica.



EUROPEAN FACTORY OF THE S.

The trolley pole catchers used last season on the open cars of the Brooklyn Heights Railroad have now been changed to the closed cars. This device is made by Wilson, Thomson & Co., of Brooklyn, and was illustrated and described in the REVIEW for September.

The Springfield and Hartford Construction Company has been organized at Warehouse Point, Conn., with a capital stock of \$25,000. The following officers were chosen: President, George W. Dunham, of Flemington, N. J.; vice-president, George Phelps, Warehouse Point; secretary and treasurer, E. R. Gillman, New York city, and a board of directors composed of seven members.

The W. R. Garton Company, formerly in the Ashland block, is now installed in its new quarters at 231 South Canal street. The company acts as consulting engineer and manufacturers' agent for electrical and street railway supplies; wires and cables and tapes of all kinds are carried in stock, and a specialty is made of calibrating and repairing instruments.

Elmer P. Morris had an exhibit of street railway appliances at the Pennsylvania state convention in Scranton, October 19 and 20. The extensive line of supplies for which Mr. Morris is

According to report J. G. White & Co., engineers and contractors, 20 Broadway, New York, are beginning to ask quotations on the various requirements for the electric railway which they are soon to build in one of the principal towns in Australia.

The '98 catalog of "Appliances for Electric Railways," of the Central Union Brass Company, of St. Louis, is very complete and of neat and convenient form. The catalog is profusely illustrated and contains a complete price list. The appliances comprise a full line of "Gem" hangers, trolley wheels and harps, insulators, gears and pinions, mica segments, commutator segments, lightning arresters, bells, bonds, brushes, wire, switches, lamps, etc.

The Scarritt Furniture Company, St. Louis, is manufacturing the major portion of railroad seats used on both steam and street railways in the west. Its eastern trade is also extremely heavy, and being one of the oldest, as well as the largest manufacturers of car seats, in the world, it is not surprising that old



customers continue to use its products and new ones are constantly being added. In variety, style and wearing qualities the Scarritt seats have no superiors, if indeed they are equalled by any other.

A local paper in the Rocky mountain district displays the following terse and convincing statements each day on the upper corners of its front page:

A merchant in a certain town never placed but one advertisement in a newspaper—and that was a sheriff's sale notice.

Another merchant had his advertisement in the newspaper every morning—and now he has quit walking to his office, but rides in his own carriage. Nuff sed.

The European factory of the Standard Paint Company, of New York, the erection of which was begun July, 1897, at Hamburg, Germany, was completed in February of this year and the same products that are made by the Standard Paint Company at the American works are now regularly manufactured at Hamburg, and are being supplied to all parts of Europe from



EUROPEAN FACTORY OF THE STANDARD PAINT COMPANY.

that point. The products of the foreign factory include P. & B. roofing, building sheathing and insulating papers, and preservative, roofing and structural paints. The president of the company, Mr. Shainwald, has devoted a great deal of time and attention to the establishment of the European works, and on our requesting him to give us some idea of the condition of affairs abroad, stated that there is very great activity in all electrical interests in Europe, and that there is a very large demand for all grades of the P. & B. products abroad. There are especially large demands for the P. & B. electrical compounds and the P. & B. tape and armature varnish. These are in use by nearly all the leading manufacturers and traction companies in all the European countries. There is a very great amount of work going on in street traction, especially in the cities of Great Britain and Germany. Italy is also coming to the front rapidly in these interests. The accompanying illustrations are views of the Hamburg Works.

Henry P. du Bellet, late U. S. consul at Rheims, France, has removed to Paris, 22 rue de Tocqueville, with the intention of remaining there at least until the close of the Paris exposition of 1900, and is prepared to act for parties desiring a permanent

or temporary agent in Europe and particularly in France. Mr. du Bellet has had a long experience in business affairs in the United States and abroad, and his record is a guarantee of the value of the services he is able to render.

The Leather Preserver Manufacturing Corporation, 30 West Monroe street, Chicago, is prepared for repairing, cleaning and renovating leather belts of all kinds. A dirty, oil soaked belt after passing through this belt hospital will be returned in first-class condition, and that without injury to the leather or cement. The belts may also be treated with its "Amber" leather preserver which renders them oil, water and steam proof. Old belts are also purchased and whatever their condition may be an offer will be made and if it is not acceptable the belts will be returned and the freight paid.

During the past summer the Joseph Dixon Crucible Company, of Jersey City, N. J., has added an extension to its pencil factory, 40x90 ft., three stories high. The same is driven by electric power from generator placed in the main factory. During 1899 various other additions will be built to the Dixon Company's

very extensive plant. The company was established in 1827, but no year has in any way equaled 1898 for volume of business; its plant has been running continuously, yet the company is behind its orders in all departments. As the Dixon Company's products go into every known field of industry, the rise or fall of the volume of its business may be taken as a very excellent standard or pointer on the condition of business generally.

The New Process Raw Hide Company, of Syracuse, N. Y., is constantly receiving favorable reports from those using its goods. The following letter from Howard W. Sexton, president of the Oxford Lake Line, Anniston, Ala., is a sample: "We have not yet received the rawhide pinions recently ordered. Please trace them at once, and also send two by express, and four more by freight. We are pleased to say that all of these wheels that we have used have seen, already, very hard and long service and are still giving very excellent satisfaction, so that we have decided to adopt the rawhide pinion and do away with the gear cases."

Negotiations are pending whereby the system of the Electric Third-Rail & Signal Company will be introduced on the subur-

ban lines of a prominent steam road entering St. Louis. This is to be done without interfering in any way with steam traffic and the installation will be made at comparatively small expense. The suburban traffic has suffered severely from competition by trolley cars, but it is expected that through the introduction of this system and electric cars that a large portion of this traffic will be regained. D. Wishart is president and general manager of the Electric Third Rail & Signal Company.

By reason of the close business relations existing between the Charles Munson Belting Company, of Chicago, and the firm of A. Groetzinger & Sons, of Alleghany, which was forced to make an assignment, the former on October 15 made an assignment without preference, to the Chicago Title & Trust Company. Under the direction of the county court of Cook county, the assignee is carrying on the business of the Charles Munson Company, filling orders in the usual course of trade and upon the usual terms of credit. The old employes have been retained by the assignee, and it will attend to the trade as the company has heretofore done.

The Detroit Air Brake Company is coming to the front with an improved air brake for street railway work, and is certainly making a record in its own city as evidenced by the following letter from F. W. Brooks, general manager of the Royal Railway Company—the Mt. Clemens Fast Line—under date of August 25, 1898: "Gentlemen: We believe the results obtained from the brake furnished us by you, and which has been in service on our car for about one year, fully warrant us in adopting your brake as a standard for our system. I have therefore notified our master mechanic that we would discard all of the Hunt air brakes now in service and put yours on instead."

R. G. Vance, Jr., superintendent of the Stevens Coal Company, writes the Westinghouse Electric & Manufacturing Company regarding one of the Baldwin-Westinghouse mining locomotives as follows: "It has been running since May 1, and has not cost a dollar in the shape of repairs, excepting a new valve for the sand box and a head light base broken in a collision with a car. It is running on a road laid with 25-lb. rails, 4,000 ft. long, over undulating grades varying from 1 to 6 per cent. Its regular load now consists of 20 cars of 1½ tons capacity, and the time required for each round trip is from 17 to 19 minutes. We have pulled as high as 25 of these cars at one trip, which it did with all ease. When necessity requires, we can pull 30 cars, 50 per cent greater capacity than you guaranteed."

The Stirling Company, of Chicago, which has installed large numbers of boilers throughout the anthracite region, has recently entered into a contract with the Cramp Ship & Engine Building Company, under the terms of which it acquires all of the Cramp Company's rights, patents, etc., in water tube boilers for marine purposes and undertakes to manufacture all water tube boilers that the Cramp Company may require for a period of 10 years. The first orders placed under the agreement represent about 40,000 h. p. of the Niclausse type for a Russian battleship and cruiser. The company has also closed a contract for the equipment of a number of torpedo boats for the United States government. The sales of Stirling boilers meantime continue large, showing an improvement of over 150 per cent in excess of the sales in the corresponding period of 1897. The Stirling Company's shops at Barberton, which were doubled in size in the spring, will now be again enlarged and additional tools and equipment will be installed.

The Mica Insulator Company, of New York, Chicago and London, maker of "micanite" materials for high grade insulation, reports a gratifying demand for its commutator rings. It makes a specialty of manufacturing molded insulation and is now turning out, for some of the large manufacturers of electrical machinery, molded rings, all in one piece. This pattern of ring is the most difficult insulation to make. But the ring, as it comes from the machinery of this company, is as perfect as a stamped piece of steel ware, and has the same metallic ring.

Electrical manufacturers will do well to write the company, sending their blue prints for estimates. Another form of insulation of which it has made a specialty is the armature trough, or slot, which is now in use by many of the manufacturers of motors for crane work, and by those who require a heavy insulation, which will stand a very high voltage. While this form of insulation is a trifle more expensive than the common red paper and "mica," yet these concerns which make machinery which receives such rough usage have found it necessary to get the best possible insulation for their armatures.

Harold P. Brown received a letter from J. K. Brooks, superintendent of the Niagara Falls & Lewiston Railway, which is as follows:

"Three years ago we put in the plastic rail bond on the Niagara Falls & Lewiston Railway, with seven miles double track, 70-lb. T-rail. At the Lewiston end is a heavy grade beyond which is a road leading 10 miles farther to Youngstown, which uses our tracks as a rail return to Niagara Falls. We run heavy cars which climb the grade at quite high speed, though there are no return conductors but the rails. I have carefully examined the bonds from time to time and find them soft and plastic and the contacts perfectly bright. They are as good as new after three years' use, and tests show that their conductivity is still equal to that of the rail itself, as you told us would be the case. The cost of labor and material in putting in the bonds was very reasonable and an ordinary foreman ought to be able to run a bonding gang with the regular laborers."

An elegant wall hanger, or poster, has just been issued by the Egan Company, Cincinnati, O., which makes a full and complete line of all kinds of machinery for working wood. It is handsomely designed and is printed in two colors, red and blue, and being on fine white paper makes that patriotic combination of colors contained in Old Glory. This poster shows about 100 of its latest improved machines, specially adapted to planing mills, carpenter, sash, door and blind work, furniture, chair and bracket factories, car, railway, bridge and agricultural works, buggy, carriage and wagon builders, spoke, wheel and handle factories, colleges, technical schools, state institutions, navy yards, etc., and every user of machinery should have one of these hung up in his office to refer to. Send for one, stating that we told you to do so, and the company will mail you one free, postage paid. This company, which is the largest wood working machinery concern in the world, has had a special corps of expert mechanics and draughtsmen at work for the past year or 18 months, whose only duties have been to design machines on advanced principles and improve those already built. The line of machinery it now has to offer is superior to any other on the market, and it can furnish either single machines or complete equipments for doing any kind of work in wood.

The Sterling Supply & Manufacturing Company, of New York, is equipping the Nassau Electric Railroad, of Brooklyn, with the No. 3 registers to be used for transfers only, as the cash fares are registered on the Sterling No. 1. The Coney Island & Brooklyn Railroad Company has placed an order for 150 of the Sterling No. 3 registers.

The H. W. Johns Manufacturing Company, of New York, is having great success with its new electric heater. Among the recent orders are orders from the Nassau Electric Railroad and the Coney Island & Brooklyn Railroad, of Brooklyn; the North Hudson County Railway, Hoboken, N. J.; the Fonda, Johnstown & Gloversville (N. Y.) Railroad; the Binghamton (N. Y.) Railroad; the Dayton (O.) & Western Traction Company; the Mill Creek (O.) Valley Street Railway; the Portsmouth (Va.) Street Railway Company; the United Traction Company, Reading, Pa.; the Wilkesbarre & Wyoming Valley Traction Company, Wilkesbarre, Pa.

The Syracuse (N. Y.) Rapid Transit Company is weeding out some of the undesirable ones among its employes.



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<b>Van Wagoner &amp; Williams Hardware Co.,</b> Drop Forged Copper Commutator Segments.	<b>Cleveland, O.</b>	<b>Partridge Carbon Co.,</b> Self-Lubricating Motor and Generator Carbons.	<b>Sandusky, O.</b>
<b>J. M. Atkinson &amp; Co.,</b> Flexible Horse Shoe Rail Bonds.	<b>Chicago, Ill.</b>	<b>W. T. C. Macallen Co.,</b> Standard Overhead Insulation.	<b>Boston, Mass.</b>
<b>American Electric Heating Corporation,</b> Electric Car Heaters of Every Design.	<b>Boston, Mass.</b>	<b>Bradford Belting Co.,</b> "Monarch" Insulating Paint.	<b>Cincinnati, O.</b>
<b>American Rail Joint &amp; Manfg. Co.,</b> "Boltless" American Rail Joints.	<b>Cleveland, O.</b>	<b>Sterling Varnish Co.,</b> Sterling Extra Insulating Varnish.	<b>Pittsburg, Pa.</b>

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SEND FOR CATALOGUES.

### HALF FARES.

The Lansing (Mich.) City Electric Railway Company is reconstructing some of its track work. It is laying 60-ft. rails on the Washington avenue line.

An electric road is projected from Santiago to El Cancey, Cuba, but the work will doubtless await the formation of a permanent government in the island.

All the steam roads now doing business between Niagara Falls and Buffalo now allow two days on their tickets between these stations, the price of which they recently reduced to meet the trolley competition.

The Middletown (N. Y.) Traction Company has been placed in the hands of a receiver upon application of its directors. William R. Royce was appointed receiver by the supreme court and placed under a bond of \$40,000.

Forest fires have raged in many localities in the west this autumn and have threatened the Mt. Lowe railway. It was only after the most strenuous efforts of the railway employes, with the assistance of volunteers from Pasadena, Cal., that the railway property escaped serious damage.

One of the American volunteers in Manila in writing home concerning the street cars there says: "The cars are little boxes drawn by the smallest bits of horses. The car got off the track three times on the way down town and on the way back we all had to get out and push up hill—and it was up hill most of the way."

The Buffalo, North Main & Tonawanda road has been dismantled to the line of the village of Tonawanda. The company

has expressed a wish to have the ties and rails remain in the paved streets, but to this the village trustees object, but the matter has been placed in the hands of the street committee with full power to act.

What was reported some weeks since in the daily papers as a strike on the Lowell, Lawrence & Haverhill (Mass.) Street Railway because of a rule requiring the employes to give bonds, turned out not to be such. A number of the men refused to give bonds and left the company's employ; their places were filled by men willing to give bonds.

The promoters of the Rochester & Sodus Bay electric railway have discovered that the Rome, Watertown & Ogdensburg road, which is owned by the New York Central, opposes their project. At a hearing before the railroad commissioners of New York, Attorney Ira M. Place of New York entered a protest against the granting of the franchise.

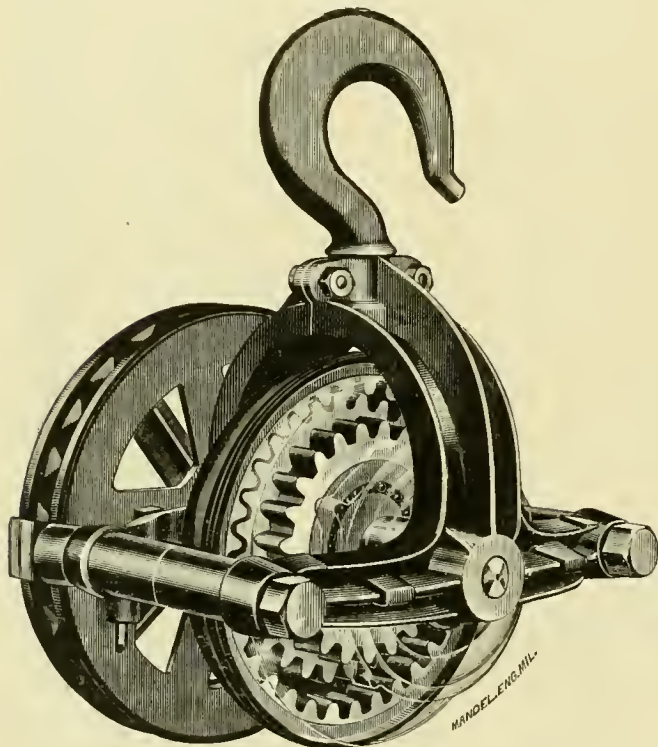
October 26, the court entered an order permitting Receiver Tidman of the Lake Ontario & Riverside Railway Company, of Oswego, N. Y., to cease operating the road until the paving of certain streets is completed, as to run cars with the line broken as it is would cause a deficit of about \$100 per week. The paving will not be finished until about the middle of December.

A contract has been signed by representatives of the Brooklyn and Kings County elevated railroad companies and J. L. Shea, commissioner of bridges, whereby the Kings County Railway Company can run its cars over Brooklyn Bridge. An annual rental of \$30,420 is paid for the use of the elevated tracks of the Brooklyn company, with an excess charge of 10 cents per car per trip if more than 833 cars are run over the bridge per day. This contract may be terminated by a 15-days' notice by either party.

## MOORE'S DIFFERENTIAL CHAIN PULLEY BLOCK.

The Moore Manufacturing Company, formerly of Milwaukee, on October 1, moved its office and plant to the works of the HP Nail Company, at Cleveland, O., which has an important stock interest in the former company, and offers it the benefit of its manufacturing facilities.

The Moore Manufacturing Company is making several specialties which will interest street railways, such as chain hoists, trolleys for use in shops or car houses, door hangers and rails.



MOORE'S DIFFERENTIAL CHAIN PULLEY BLOCK.

etc. We illustrate herewith its anti-friction differential chain pulley block with an automatic brake for locking it when under load. The hand chain runs over the wheel, which is on the extreme end of the shaft. On the shaft is a fixed eccentric on which turns a double pinion; the bearing of the pinion on the eccentric is through rollers, reducing the friction to a minimum. The two pinions are of different diameters and mesh with annular gears on the wheels over which the lift chain passes. The rotation of the pinion is a consequence of the rotation of the shaft and the eccentric and the result is a movement of the two lift chain wheels relative to each other. By his arrangement, the hand and lift chains being entirely separate and distinct, the excessive travel of the lift chain under load is avoided.

The block tends to run down under the load and to prevent this an automatic brake of ingenious design is provided. A friction plate in contact with one side of the hand chain wheel is locked in that position by two wedging clutches, when the wheel is at rest; motion in one direction releases one clutch, and motion in the opposite direction, the second one.

## \$400 FOR A MISTAKE.

In the REVIEW for June last, page 378, was reported a decision of the appellate division of the supreme court of New York, in which it was held that the holder of a transfer was entitled to wait for a car with a vacant seat. A supplemental decision was reported in the REVIEW for August, page 567. The case was remanded for retrial and the jury gave the plaintiff a verdict for \$400. He had waited half an hour for a car, and as the transfer was good for ten minutes only the conductor on the second car ejected him, and caused his arrest.

## THE CLEVELAND FOUR-CENT FARE ORDINANCE.

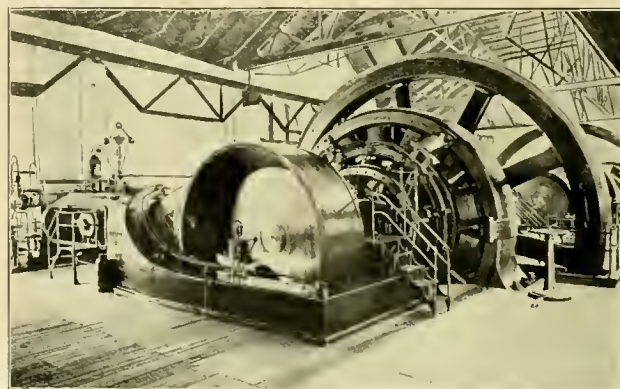
On October 17 the city council of Cleveland, O., passed two ordinances affecting the two urban street railway companies and providing for a reduction in cash fares to 4 cents, and the sale of seven tickets for 25 cents. The avowed purpose of this action was to lead to suits in court in order that the right of the council to reduce car fares might be adjudicated. The mayor stated publicly that the city would defend all persons for whom trouble was made by reason of refusing to pay more than 4 cents. The ordinance was to go into effect November 1.

October 29 the Cleveland Electric Railway Company and the Cleveland City Railway Company filed a bill in the United States circuit court praying an injunction to prevent the city enforcing the ordinance. The companies declared that the proposed reduction of fare would be in violation of the contract entered into between the city and the companies when the franchises were granted, and for that reason would be contrary to the provisions of the constitution. Furthermore, that the proposed reduction of fare would result in a reduction of the receipts of the companies by one-fifth, while the operating expenses would remain the same. Figures were given in the petitions to prove this claim, and that the roads could not be operated at a profit if the ordinances are enforced.

The court granted a temporary restraining order, which prevents, for the time being, the city from enforcing the ordinance.

## WALKER GENERATOR FOR BROOKLYN.

It has been found necessary to increase the capacity of the Kent Avenue power station of the Brooklyn Heights Railroad Company. This power house was built in 1893 and was the largest in the country at that time. It was equipped with six E. P. Allis cross compound engines each rated at 2,000 h. p. but capable of carrying a 50 per cent overload, and direct connected to a 1,500-k. w. 12-pole generator. The boiler plant consisted of 36 Babcock & Wilcox water tube boilers. Even this equipment be-



WALKER GENERATOR IN KENT AVENUE STATION, BROOKLYN.

came inadequate for the current demand for the old and new lines and the extensions. The new unit is a 1,600-k. w. Walker generator direct connected to an E. P. Allis engine. The field frame is 16 ft. in diameter, the armature 12 ft. 6 in. and the commutator 8 ft. in diameter. The dynamo has 14 poles, and a speed of 75 r. p. m. The floor space occupied is 8 ft. 6 in. wide by 18 ft. 6 in. long. The normal voltage is 600 and the current output 2,666 amperes.

The Macon (Ga.) & Indian Springs Electric Street Railway Company has petitioned the secretary of state to have the name changed to the Macon Electric Light & Railway Company. There will be an increase of 400 shares in the stock of the company and bonds to the amount of \$100,000 will be issued.



**THE NEW CHICAGO ROAD.**

Fred H. Fitch, formerly superintendent of the Southwest Missouri Electric Railway, resigned that position in September and came to Chicago to take up the construction work of the General Electric Railway, which has franchises for a road in



F. H. FITCH.

South Dearborn street, Custom House place and Plymouth place as far north as Jackson street; the motive power permitted was any other than overhead trolley or steam, and the storage battery was decided upon.

The contract for the work was let by Mr. Fitch to a construction company which began work in Plymouth place with a large force of men at midnight on Saturday, October 29. The object of commencing at that time was to incommode traffic in the street as little as possible. By 1:30 p. m. on Sunday 800 ft. of track was laid and a storage battery car running; at this time the construction work was stopped by

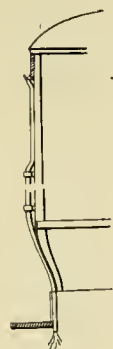
reason of an injunction issued by Judge Payne of the Cook County superior court. This injunction, issued on the petition of the Chicago & Western Indiana Railroad, was dissolved the following Wednesday, November 2, and within 15 minutes thereafter 300 men were at work and by 6 a. m. Thursday about three-quarters of a mile of track was completed. The work of laying track in Dearborn street has been continued.

Work in Custom House place was stopped by an injunction of the United States district court, issued on petition of the Chicago, Indianapolis & Louisville Railway Company, which complains that the street railway will damage its property by preventing free access to its freight houses and yards.

The Chicago & Western Indiana built a piece of temporary track and wrecked a train in order to stop work on the General Electric but it was of no practical assistance, being all cleared away soon after the first injunction was served, and had it remained could have been easily removed by Mr. Fitch.

**ROOF DRAINS FOR STREET CARS.**

Before one enters a street car on a rainy day he must of course put down his umbrella, and having done that has no protection as he steps under the drip that falls from the edge of the hood on closed cars, or from the name board on open cars. On open cars the dripping from the name board not only falls upon the passengers as they enter but drops on the curtains and on the seats.



One of the best ideas that has been applied to street cars in a long time is that of the Safety Appliance Company, of Boston, to make the grab handles (which on most open cars consist of 1-in. tubing) serve as roof drains also. As shown by the accompanying cut, this is done by extending the grab handle up to a gutter fastened under the name board and down below the running board. The Metropolitan Street Railway, of New York, is equipping its cars in this manner, and the patrons of the road are very hearty in expressing

their appreciation of it.

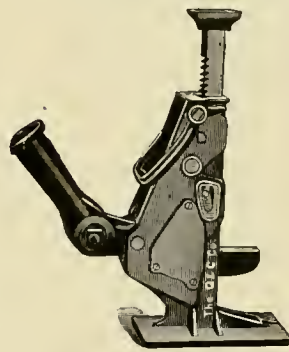
The Safety Appliance Company has headquarters in the Wentworth building, Boston.

The president and directors of the Cataract Power Company of Hamilton, Ont., on November 12 handsomely entertained a large party of invited guests, taking them to visit the power house at Decew Falls, and on their return to the transformer station in Hamilton. Special cars left the city at 12:30 p. m. for the falls and returned at 6:45 p. m.

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## OPEN CARS IN LONDON.

In the last issue of the REVIEW comment was made on the fact that open cars were introduced for the first time in London this summer. The London, Camberwell & Dulwich Tramways Company had a number of open cars built and they have proved im-



OPEN TRAM CAR, LONDON.

mensely popular during the past season. They were operated on a horse car line three miles in length. The illustration, for which we are indebted to the "Railway World," of London, shows the type of car. It measures 21 ft. over all, 7 ft. 8 in. over the steps and has a wheel base of 6 ft. 6 in. The cross benches have reversible backs.

Electric sprinkling cars have been put in service at San Diego, Cal.; salt water is used for sprinkling the tracks.

The Milwaukee, Racine & Kenosha Electric Railway Company is seeking a franchise for Milwaukee avenue, Kenosha, Wis.

Judge Grosscup, in the United States district court, decided against the Chicago General Railway in its effort to have the city of Chicago enjoined from cutting the wires supplying power to lumber mills.

Albert C. Emmerick has been relieved from his position as receiver of the Buffalo, Kenmore & Tonawanda Electric Railroad Company by the court. He certified that he received \$5,304.99 and paid out \$4,343.02.

It is stated that arrangements have been made for purchasing the property of the Rome (N. Y.) City Railway Company by Philadelphia capitalists. In event of the sale electric traction will likely be introduced.

The Harrisburg (Pa.) Traction Company has decided that it is unwise to issue bonds to cover its floating indebtedness. The stockholders prefer that scrip dividends, redeemable in treasury stock at par, be issued and the net earnings applied to extinguish the floating debt.

The gross passenger earnings of the Brooklyn Rapid Transit Company's system for the month of October were \$509,629, as against \$443,923 for October, 1897, and \$420,384 for October, 1896. For the three months ending October 31, 1898, the gross passenger earnings were \$2,168,231.

George A. Steele, of Portland, Ore., has petitioned the United States court to be declared bankrupt; assets \$150,000 and liabilities \$411,000. The failure was due to a foreclosure sale of the property of the East Side Railway Company, whose lines extended from Portland to Oregon City.

General Manager Kelsey, of the Winchester Avenue Railroad Company, of West Haven, Conn., informs us that three double truck cars for winter service have been ordered. The car bodies are 26 ft. long and will be fitted with Brill maximum traction trucks and two Westinghouse 30-h. p. motors each.

After four years, during which the money was tied up because of the road being in the hands of a receiver, 43 of the employes of the San Francisco & San Mateo Electric Railway have recovered their deposits of \$25 each, made as a guarantee for their good behavior when they took positions with the company.

A 4-cent fare ordinance, introduced in the Milwaukee city council, has been laid on the table, as the judiciary committee thought it desirable to await the outcome of the Cleveland ordinance, the validity of which is soon to be tested in the courts, before it recommended the Milwaukee council to try its hand again.

George E. Fisher, general manager of the Richmond (Va.) Railway & Electric Company, was assaulted on the street and severely injured by a man formerly in the company's employ as a conductor. The only reason given for the assault was that Mr. Fisher declined to consider the man's grievance at that time and place.

The Elizabeth (N. J.) Street Railway Company petitioned the council for permission to change the motive power of the East Jersey street line from horse to electric; the petition was granted with the proviso that the fare be reduced to three cents for two hours in the morning and evening, but the company refused to accept this.

An inspection trip was taken over the lines of the Brooklyn Heights Railroad Company for the benefit of a number of foreigners who are interested in electric railways. Among those present were S. Oi, engineer to the Ministry of Communication of Japan; T. S. Horiye, general manager of the Tokio Carriage & Wagon Works, and the Kiushiu Railway; William Thow, chief engineer of the New South Wales Government Railways.

It is rumored that there is a possibility of the Niagara Falls Park & River Road being extended to Niagara-on-the-Lake on the north and to Fort Erie on the south. The present route of the road is between Chippewa, Ont., and Queenstown, Ont., along the bank of the Niagara river on the Canadian side. It has entrance to Niagara Falls, N. Y., over the upper steel arch bridge, and it is expected to enter Buffalo or to secure a connection with the roads in that city over the International Bridge, which is soon to be rebuilt, when it will afford room for trolley as well as steam car tracks. The company controls the necessary franchises.

## EXCURSION RATES VIA UNION PACIFIC RAILROAD.

If you contemplate a trip west, bear in mind Home-seekers' Excursion rates are December 6th and 20th, one fare for the round trip plus \$2.00 from Chicago or territory up to Missouri River, to points in Kansas, Nebraska, Colorado, Wyoming, Utah and Idaho. Tickets will be good 21 days from date of sale and can be routed via Omaha or Kansas City. Stop over privileges will be granted in Home-seekers' territory. These tickets are first-class and good on all trains.

Through car service from Chicago to Denver, Salt Lake City, San Francisco, Portland and intermediate points. Trains are equipped with Pullman palace sleepers, Pullman tourist sleepers, free reclining chair cars, buffet library and smoking cars, and dining cars where meals are served a la carte.

Ask for tickets via Union Pacific R. R. For information address, W. T. Holly, General Agent, No. 206 S. Clark street, Chicago, or E. L. Lomax, G. A. & T. A., U. P. R. R., Omaha, Neb.





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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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This paper is a member of the Chicago Trade Press Association.

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VOL. 8, DECEMBER 15, 1898. NO. 12

Street railway companies in states whose legislatures hold sessions this winter and particularly if it is desired to secure the passage of new legislation, will be interested in the summary of last year's legislation compiled from the session laws of 1898 and published in this number.

The investigation in behalf of the Board of Trade which Major Cardew made of the tramway accident at Bradford, England, on September 19, shows that the electrical apparatus was not at fault. The car left the track on striking a sharp curve at the bottom of a steep grade, which combination was most favorable for such an occurrence. Doubtless many who read the press dispatches announcing the accident feared that it would be charged to the electric system, and have the effect of arousing opposition to contemplated electric tramway installations. The report of Major Cardew is abstracted on another page and clearly shows that the system was not at fault.

The many of our readers who, from personal inspection, are familiar with the splendid operating system of the Boston Elevated Railway Company, will certainly construe its recent adoption of the service stripe system as a strong argument in favor of the plan. The public recognition of continued service, as expressed by the bars, not only tends to command increased respect of the public for the employe

and his company, but the natural and commendable pride thereby stimulated in the ranks is an excellent thing.

We note the increasing number of companies which have adopted the plan, and as none of them seems inclined to drop it after trial, we believe it is a feature of street railway work deserving general use.

In the language of Congressman Culberson of Texas, "we have done expanded" as to territory, and now the expansion must be along the lines of foreign commerce. In order to better inform American manufacturers as to the exact demands in foreign markets and foreign buyers as to the advantages of American goods, the Philadelphia Exposition Association has been organized to hold an exposition of American manufactured products, suitable for export, in Philadelphia in 1899. The proposed exposition is to be under the auspices of the Philadelphia Commercial Museum, an institution which has done much valuable work in promoting the objects for which the exposition is undertaken. A bill to authorize the exposition is now before Congress, and it is hoped will pass the House; it passed the Senate at the last session.

The "grab-handle man," whose operations at Joliet, Ill., St. Paul, Minn., and Canton, O., were described in the REVIEW for September, 1897, page 559, and at Stapleton, Staten Island, N. Y., in the REVIEW for August, 1898, has moved to New England, and after attempting to defraud a number of companies there came to grief. He was apprehended at the instance of the South Middlesex Street Railway Company, of South Framingham, Mass., and it is making every effort to secure his conviction. We cannot give the true name of this man, but seven names that he has at different times claimed are given on another page.

We wish to particularly commend the officials of the company for the action they are taking in this case, as these swindlers are so often allowed to escape that they appear to feel they may continue with impunity.

On another page will be found a summary, as stated by Mayor Rose, of Milwaukee, of the propositions made to that city by the Milwaukee Electric Railway & Light Company, in an effort to put an end to the 4-cent fare agitation. There was so much objection made by the press and people of Milwaukee that the company withdrew its proposal, and we publish it merely to place the matter on record.

The fact that the company wished to compromise and get on amicable terms with the city is not to be taken as an evidence of any weakness in its position, but only of its willingness to buy its peace. The courts have held that a 4-cent rate is an unreasonable demand to make of the Milwaukee Company, and there is no reason to believe that this ruling will be reversed, since the facts on which it was based amply justified it. It is generally recognized as being cheaper to compromise a law suit than fight it, if terms at all reasonable can be made; here this attempt has failed.

A few years ago it was very common to hear of the danger of the trolley circuit. One of the most powerful stock arguments of the opponents to the trolley was that the exposed overhead wires carrying a current at 500 volts was a constant menace to life. They were oblivious to the

fact that there were arc light circuits in every town and city whose potential was greatly in excess of that of the trolley circuit.

The untimely death of a line inspector in Toledo emphasizes the fact that the voltage of the trolley lines is low and safe compared with lighting circuits. The electrical inspector accidentally came in contact with a circuit at a voltage between 4,500 and 5,000, and even that did not cause instant death, for he was able to rise from the ground after he had fallen from the shock. A circuit at 5,000 volts is not merely ten times more dangerous than one at 500 volts, but it is infinitely more so.

Perhaps one reason for less public opposition to the high potential lighting circuits is that the city government either owns the system or rents the power for lighting the streets. In England, where the fallacy that the trolley wires are very dangerous has not spent its fury, high potential alternating current circuits are in general use. If the citizens can tolerate a voltage of 1,000, 2,000, or even higher for lighting purposes certainly the trolley wires at 500 volts will bring no added peril.

A city official, inspecting the lines of a street railway system, asked the superintendent how long would his cars last and how often did he have to make changes in them. The reply was that the life of a well-constructed car was about 14 years, barring accidents, but the style of cars changed about every three or four years. Very few companies send an order to the factory for cars duplicating the preceding order. The street railway companies endeavor to furnish the public with the best and most comfortable rolling stock which the conditions warrant. This necessitates changes at intervals and prevents standardizing the cars.

The Chicago City Railway Company is now experimenting with a train of cars, described elsewhere in this issue. It presents a number of innovations. The motor car is reconstructed from a cable grip car and is rather light for its work. However, there are few grades and great tractive power is not required. This reconstructed car fills a positive want, as it affords accommodation for smokers. Heretofore on the winter equipment a man had to go to the platform to enjoy his cigar. This class of patrons is numerous enough to seriously obstruct the platforms.

The feature which will at once draw attention to this car is the absence of steps, so that the passenger has to step to the platform of the trailer to get on or off. One advantage is that one conductor can readily take care of both cars. A service test only will determine whether or not this plan is a good one.

The New York Railroad Commission, in its annual report, counts in transfer passengers and those riding on passes, together with the cash fare passengers, and dividing the gross receipts by the total number thus arrived at, strikes an average. This average is in nearly every instance less than five cents, and runs as low as 2.58 cents. We think it extremely unfortunate that this has been done, for it would appear to the casual reader that the low average rate represented the prevailing rate of fare. We shall not be surprised to see the figures given misquoted by those who seem to think a railway ought to do business at less than cost.

In our judgment it is unfair to count a cash fare passenger as one, and the same person riding on another car

on a transfer as a second and additional passenger. In many cases the combined length of original haul and transferred ride is no more or even less than many single, unbroken rides furnished by the same company. The mere fact that a transfer is given does not increase the company's revenue (except in a general way as it may stimulate travel), and the transfer is made more for the accommodation of the public than the company. It would be possible to run a car direct over the route taken by the passenger with his transfer; but the frequency of service would be immeasurably decreased and inconvenience the public to an extent which would render the service practically useless. Much the fairer basis it would seem to us would be either to count the cash fares only as a basis of earnings per passenger, or reduce it to earnings per mile per passenger, counting the entire ride of a transferred passenger as so many miles for one cash fare.

As noted on another page, the Ohio legislature at its last session (1898) amended the grade crossing interlocking law, which has been in effect since April, 1896, so that "other safety devices" may be substituted for "interlocking devices" at the discretion of the railroad commissioner, and the cost of maintenance and operation of the crossing is to be apportioned equally among the roads instead of being borne entirely by the junior road. The state of Ohio was the first to enact a compulsory interlocking law, and this amendment indicates that the original plan threw too heavy a burden on the junior road.

What a revolutionizing influence the trolley works is most interestingly illustrated in Chicago. For twenty years a car track has been laid and cars operated on Indiana avenue, a desirable residence street, lined on either side with handsome homes. For many years a single track with turnouts every block or two made possible the operation of horse cars. The company desired to double track the line, but the improvement was bitterly fought for two years by the frontage owners. Finally, consent was secured, the double track laid, and the improved condition of the street was such that frontage immediately advanced five, and in many cases ten, dollars per foot. Then the trolley came to Chicago and the company had converted some hundred miles of horse lines into the better system, but the Indiana avenue people would not have it. For three years they opposed it in every conceivable manner. Associations were formed of property owners, who entered into written agreement with one another not to give their consent to the trolley. But like other good things the trolley came in time. One after another of the patrons of the line became tired of spending a half hour jogging along behind a pair of horses, when parallel lines were covering the same distance in twelve minutes. Defections occurred in the ranks, and when the tide turned it was a tidal wave, and swept all before it. The company was importuned to put poles and wires, and the result was the finest equipped trolley line in the city.

Under both horse and electric systems, these cars on the way to the business district came only to 18th street, at which point they were attached as trailers to the Wabash avenue cable. Local conditions arising out of some viaduct construction during the past ten months closed another line for that time and forced a large number of electric cars to go down town and around the Wabash loop over cable tracks. The city granted a temporary permit for overhead wires, and



this gave the Indiana avenue people trolley service all the way down town. The gain in time and freedom from annoyance consequent on the stop to attach the cable trains as trailers was demonstrated the first day; and the Indiana riders were wild with joy.

Since our previous issue the viaduct has been completed and the cars from that line restored to their own channel. Then the mayor ordered the wires down. In vain the company pointed to the advantage to the public; all in vain the people raged. The mayor is blind to anything he imagines the street railways want.

The moral, however, remains. Those same people who fought against the double track and later against the trolley on their street, now present the interesting spectacle of protesting against the removal of the wires to down-town. They not only protest, but go in self-appointed committees of tens and twenties in person to the mayor, praying for the retention of the trolley. On Thanksgiving day, at one drug store on Indiana avenue, one hundred and sixty-five voters and property-owners, voluntarily visited the store and requested an opportunity to sign a petition of remonstrance they understood some one had started.

We have seen and known of many instances where objections to trolley lines have experienced a radical change of heart after the demonstration of the electric cars was made, but we have never known of one more forcible and convincing than that cited above.

There are few institutions upon which more abuse and accusations of criminal negligence have been heaped than upon street railways. Although the general belief that the trolley car is the Juggernaut of our cities is rapidly disappearing, yet in many places the city officials and the newspapers insist on the street railway companies buying many so-called safety devices whether or not their utility has been shown. Whenever a person is injured by any street railway apparatus it costs the company a large sum of money, and it seems not to be generally understood that the company will gladly make use of any safety appliance which will save either the passengers or others occupying the streets from injury. It is simply good business policy to do so, if for no other reason desirable.

In the majority of accidents it is safe to say that the injured person is wholly or in part at fault in jeopardizing his life and limb. This has been demonstrated by an unusual number of fatal accidents recently on the elevated roads of Chicago. With its own right of way, access to which is difficult, station platforms properly guarded and safety gates on all the cars, no means of transit could be safer than the elevated.

A short time ago on the Alley L road a foreigner, evidently not accustomed to elevated railways, jumped from the station platform down to the tracks and was run down by a train before it could be stopped. Another man was thrown from the rear platform of the train when it was rounding a curve and died from the injuries. He was standing on the edge of the platform outside the safety gates, there being no conductor on the rear platform to prevent his taking that perilous position.

Two deaths caused by the cars of the Metropolitan West Side Elevated Railroad Company were even more marked by foolhardy recklessness. The platform sills of the cars are rounded at the corners to prevent contact when the trains are passing around sharp curves. Not only are there

safety gates to each car platform which the conductors and guards control, but there are guards connecting adjacent cars to prevent persons getting between them; these are loose riveted gratings to permit of their expansion and contraction when the train passes curves.

After a crowded Metropolitan train had started, a man who would not wait a minute for a following train, vaulted over one of these guards and dropped through the triangular space to the track beneath. It is supposed that he thought the platforms were square and he could occupy the vacant space, but even if that were so he would have been crushed at the first curve. The platforms were crowded with passengers and the conductor was unable to catch him. He signaled the motorman for an immediate stop, and the train was brought to a standstill within 5 ft., but the man had been caught and crushed beneath the wheels.

One of the employes was killed through an act of gross carelessness on his part. At the end of one of the lines the trucks and wheels of the cars are inspected and oiled. At this point there is a section of detached third rail with a switch connecting it to the feeder circuit. Before the oiler goes beneath the train this switch is opened and the rail is dead, so that it is impossible for the train to move. Imperative instructions are given that this switch must be opened by the oiler before he goes under the cars, but on this occasion the man disobeyed the order. The motorman closed his lamp circuit as usual, and finding he had current started the train. The oiler was instantly killed.

In such cases as these the facts as a rule are not given in the newspapers, and the public is lead to believe that the street railway companies are responsible for such accidents. However, it is true that with every conceivable precaution which the companies can take it is impossible to save a man from his own folly.

### NEW YORK STREET RAILWAY STATISTICS.

In the REVIEW for November, page 795, was published a table showing the receipts and cost of operation, both per passenger and per car-mile, on a number of the principal street railway systems in the state of New York, taken from the Report of the Railroad Commissioners.

In this table the average receipts per passenger are given as less than 5 cents in all but five cases, and as less than 4 cents on nearly one-half the roads. This does not mean that the rate of fare on these roads is 4 cents or less, but that, as John S. Kenyon, secretary of the board advises us in answer to an inquiry, by the method of computation adopted by the Commissioners the holder of each free transfer is counted as a passenger when the transfer is collected after having been once so counted when he paid his fare.

The holders of free tickets and those paying half-fare (children) are also counted as "passengers" by some roads, and thus the low receipts per passenger result.

J. T. Little, Jr., of the Metropolitan Street Railway Company, stated the case in a paper read before the New York State Association in September last, when he said "in New York City the extensive transfer system now in existence reduces the individual fare to 3 cents." It is evident that the same conditions obtain elsewhere also.

The Atlanta (Ga.) Consolidated Street Railway Company recently paid, under protest, a bill for \$16.91 presented by the city for damage to water pipes said to be due to electrolysis. The president, Mr. Woodruff, in sending the check, requested that in future the street railway company be given an opportunity to examine the injured pipes to see if it were really to blame.

## THE GRAB-HANDLE MAN AGAIN.

James J. Valentine, treasurer of the South Middlesex Street Railway Company, of South Framingham, Mass., writes that thanks to the portraits of the "grab-handle man" which was published in the REVIEW for September, 1897, and for August, 1898, that company has been enabled to corner the man and hopes to secure evidence which will place him in safe keeping. Mr. Valentine sends us the following clipping from the South Framingham "Tribune":

Aided very materially by Superintendent John W. Sullivan and his assistants in the South Middlesex Electric Street Railway company's office in Smith block, South Framingham, Chief Eagan, of the Framingham police, made a very clever capture Wednesday forenoon. He succeeded in securing "the grab-handle man," so-called, a swindler who has gone up and down the country, loosening screws from street car handles, then falling off and claiming damages for injuries thus received. Sometimes he has secured money, sometimes he has not.

It is necessary to go back a little in our tale at present, and tell the facts which led up to the arrest. Monday afternoon, November 21, the Monday previous to Thanksgiving, a stranger took the 5:15 car for Framingham Center on the Framingham Union road. He rode on the rear platform, and when on Union avenue nearly opposite the residence of Sid A. Phillips, above the Sudbury river bridge, while conductor Azariah Snow was distributing the Marlboro transfers, he motioned for the car to stop. Mr. Snow stepped to the platform in time to see the man jump off before the car fully stopped. He had hold of the grab-handle close to the car and the handle went with him, being bent nearly double by the strain. The fellow dropped on his side and was dragged a short ways before the car came to a full stop. Conductor Snow questioned him and he gave his residence as Framingham Center, claiming that he wanted to stop at Mr. Phillips's, where he had a sister employed as maid. Mr. Snow could not understand his name. He helped the fellow up, and found that he was all right except for the claim that his wrist was hurt, and he had hold of this, as if he was in pain. The man started towards Mr. Phillips's, but never called there. It is thought that he returned to South Framingham on the 7 o'clock car and then went to Natick, where he tried the same dodge in the evening. When Mr. Snow came home to supper, as he lives near the scene of the "accident," he inquired at several houses but found that no one had called, and dropped the matter, after making out his report, as of little importance. He found that two screws had been withdrawn from the handle, making it very easy for the man to take his fake tumble.

It was the same Monday evening that a stranger, in alighting from Conductor O. W. Child's car on the South Middlesex road on Pond street, Natick, was thrown to the ground, by the giving away of the grab-handle. He seemed to be hurt considerably, but was able to walk away. The "accident" happened about 9:30 p. m., the car being on its way east. The street railway men looked into the condition of the car later, and found that the screws which held the handle had been broken off by the use of nippers. The circumstances were such as to warrant suspicion, and this suspicion was embodied in the official reports made out. Superintendent Sullivan reported the affair to Treasurer James J. Valentine, and they became interested in it. Inquiry of the doctors failed to reveal any one calling upon them on the night of the "accident," and they decided to watch for their man and await his appearance with his damage claim. Meantime, the articles in the STREET RAILWAY REVIEW, which are given elsewhere, were remembered, and were hunted up, the man's photograph being found.

It was about the middle of Wednesday forenoon that a man about thirty-five or forty, a stranger, dropped into the South Middlesex office in Smith block, finding Superintendent Sullivan, clerk H. F. Spencer and Sergeant J. C. Valentine there. He claimed an injury to his left wrist, which he showed with a bandage upon it, and asked \$25.00 indemnity, claiming to have been injured by a fall from the car at Natick on the night of November 21. He gave the name of John A. Mayer, and claimed that he had gotten off at 84 Pond street, which happens to be a vacant lot. He stated

that he had been stopping on Dover street, off Union avenue, in South Framingham, but this street isn't on the map.

Superintendent Sullivan kept questioning Mayer while Sergeant Valentine went after Chief Eagan, and the latter took up the inquisition. A man was again dispatched to get Officer Place with a warrant for vagrancy, and Dr. P. O. Shea was called. When the fellow found that he was in the hands of the police, he wilted, and either fainted or simulated faintness. After some further questioning, it was found that he had occupied room 10 in L. P. Sleeper's lodging house in Irving square the night before, registering as Gustav Mayer.

Dr. Shea pronounced the man and his wrist all right, and he was taken to his room where was found an extension case containing among other things, an eight-inch nearly new screw driver wound with rags, so as to render concealment up the sleeve an easy matter, two pairs of ordinary pinchers, with their ends covered with brass, as though they had many times nipped off grab-handle screws, a wrench and a nail set.

Mayer was locked up and held till yesterday, when he changed his name, giving it to Chief Eagan as Joseph M. Zimmerman, his age as thirty-eight, his residence 294 Broadway, Cleveland, Ohio, his nationality German. He refused to talk much about himself and would acknowledge nothing.

In court, he pleaded not guilty to the charge of vagrancy, and his case was continued a week, to allow an investigation into his record. A new charge will probably be made against him, if suspicions held are proven to be reasonably true. Witnesses held for the government are James J. Valentine, treasurer of the South Middlesex; Superintendent J. W. Sullivan, Motorman J. T. Donnelly, Conductor O. W. Childs, J. C. Valentine, all of the South Middlesex, and Assistant Superintendent A. Snow of the Framingham Union. Zimmerman was committed to jail in default of sureties in \$500.

Chief Eagan saw Chief Watts of Boston, and he was to look up the fellow. So also were claim agents of the Boston Elevated Railway, who were communicated with. He claimed to have been here about three months ago, and last September 11 a man registered at the Winthrop House as J. F. Meyer of Baltimore. It may have been the same fellow looking the territory over.

## COLLISION WITH FIRE TRUCK.

By reason of a collision between a fire hook and ladder truck and one of its cars, in which two men were killed and two others severely injured, the Duluth (Minn.) Street Railway Company was called upon to defend four damage suits.

The case of Warren, one of the injured men, was decided on December 2, in the district court at Duluth. After the plaintiff had concluded his case, Thomas S. Wood, attorney for the company, moved for a verdict on the ground that the plaintiff's testimony clearly proved contributory negligence. After argument, Judge Moer directed a verdict for the company.

The ground on which the verdict was directed, contributory negligence, was based largely on the testimony of the driver of the truck. He testified that when he was driving down Lake avenue he saw the car, and he also saw that the motorman was not looking. At first he thought of stopping, but when he saw that the motorman was not looking that way and that the car was not going fast he decided to take his chance of getting by the car. The next moment the car and truck came together and the accident occurred. Judge Moer said that it was the duty of the fire department to drive carefully at all times in coming down the avenues.

The other three cases will probably be continued until this one is passed upon by the higher courts, if it should be appealed, as they all involve the same question.

One of the cars of the Detroit, Ypsilanti & Ann Arbor Railway was derailed a few blocks outside of the Detroit city limits on November 16. The car fell on its side in the ditch alongside the track, and was not damaged beyond four broken windows. None of the 23 passengers was hurt.

The Lima & Honeye Falls (N. Y.) Electric Light & Railroad Company was obliged to close down its power house on November 13 by reason of a strike.



## STREET RAILWAYS OF MEADVILLE, PA.

The Meadville Traction Company owns and operates the 10½ miles of electric lines in and about that prosperous Pennsylvania city. Since the system was opened for traffic April 14, the business has been unexpectedly heavy, and on some lines the facilities have been inadequate for carrying the passengers.

The famous Ponce de Leon Springs, which are celebrated for their wonderful medical properties, are connected with the city by one of the lines and have proven a great drawing card during the past season. On this route is also Oakwood Park, which the company has made a popular resort. Since April 14 on this route, which is known as the Springs line, 350,000 passengers have been carried. The 30-ft. cars have generally been taxed to their utmost capacity and at times have carried as high as 123 passengers on one trip.

The proprietors of the Ponce de Leon Springs will soon erect a fine hotel for the accommodation of those who come to take the waters. For Oakwood Park the company has engaged Prof. Eugene Schmidt's band from Pittsburg to give concerts afternoon and evening throughout the coming season. Other attractions usually found at pleasure resorts will also be provided, and it is anticipated that next season will be even more prosperous for the company than the past one has been.

The system is not a large one but it is suited in every way for the city and territory it serves. It is modern in every particular and only the best materials and machines have been used. The track is laid with 70-lb. Cambria girder rails in the city and the three miles of track outside the city limits are laid with 60-lb. T-rail. Chestnut and white oak ties, 5 by 9 in. by 7 ft. are spaced 30 in. between centers. Each joint is connected with a Johnson rail bond of No. 0000 copper wire. The track is cross-bonded every 300 ft. with No. 0 tinned wire. The poles are octagonal in shape and painted an olive green. The span wire consists of 5-16-in. seven strand galvanized steel cable. No. 0 hard drawn trolley wire, tested to a tensile strength of 4,400 lbs., is used. The feeders are tapped into the trolley wire every 1,000 ft. and on grades every 300 ft.

The cars are all similar in design and are 7 ft. 4 in. wide and 30 ft. over all, 5 ft. on each end being taken by a vestibuled platform. A car weighs with its equipment about 15,000 lbs. and costs approximately \$2,000. Eight of these are now in service, but this number will soon be increased to 13. The cars are mounted on Dupont trucks and each has two 35-h. p. motors.

boiler room covers a space 28 by 95 ft. The stack is 125 ft. high, 9 ft. in diameter at the base and 6 ft. at the top. For a distance of 30 ft. from the bottom the stack is constructed of ½-in. steel, the next 30 ft. of ¾-in. and the rest of 1¼-in. plate. There are two 250-h. p. Berry vertical boilers, each having 1,596 2-in. flues.

The steam is taken by a 9-in. copper pipe from each boiler and



IN OAKWOOD PARK.

passes into the main pipe, along which are a series of valves so arranged that either of the boilers can supply either of the engines. The 50-h. p. feed water heater receives the exhaust steam from the condenser and water pumps and the feed water is heated to a temperature of 208° F. The feed water pumps are in duplicate.

The engine room is 67 by 105 ft. and contains two 250-h. p. high pressure condensing corliss engines running at 120 r. p. m. On each engine shaft are a fly-wheel, 16 ft. in diameter and weighing 15 tons, and the armature of a 225-k. w. multipolar generator. The engine shaft and armature weigh over 16 tons and the fields of the generator 11 tons. An automatic oiling sys-



VIEWS OF THE POWER HOUSE.

The car bodies are finished in cream and red with black and silver trimmings. The number of each car and the words "Meadville Traction Company" are put on with gold leaf. The cars are heated by American electric heaters and each one lighted by 11 incandescent lamps.

The power house occupies a site 95 by 103 ft. and its walls are 18 in. thick and 28 ft. in height. The roof is steel trussed with a sheathing of 2-in. pine and this is covered with slate. The

tem has been installed. A tank is placed 12 ft. above the floor and piping extends from it to each bearing. From the drip pans the oil is taken to a filter and then by means of a small steam pump is forced back into the tank. Between the two engines is a large Dean condenser which receives the cooling water from a creek near by. An exhaust steam pipe leads to the roof of the station whereby the engines can be run non-condensing if necessary.



The switchboard consists of 11 Georgia marble panels, and is 18 ft. in length and 8 ft. high. On the first panel are switches, rheostats, ammeters, circuit breakers, ground indicators and the plug switches for correcting the voltmeters. Each generator panel has an ammeter and a voltmeter reading to 750. A station ammeter and wattmeter and a Bristol recording wattmeter are on the center panel. The remaining six panels are for the feeders extending to different points on the company's lines.

The officers of the company are: Frank R. Shryock, president; George D. Trawin, vice-president; Dr. Cyrus See, secretary, and



FIRST CAR OVER THE LINE.

Charles Fahr, treasurer. These officers together with J. J. Shryock and H. H. Thompson constitute the board of directors. The president of the company more than any other man is responsible for the final success of the railway. Five years ago he laid out plans for the system but the panic prevented financial arrangements at first. At last all the difficulties were overcome by Mr. Shryock's faith and persistency in the undertaking. The consulting engineer for the company has been A. Langstaff Johnson, of Richmond, Va., who has long been engaged in street railway work. The bond used on this road is one of a number of important electric railway devices he has patented.

### REPORT ON THE ACCIDENT AT BRADFORD, ENGLAND.

On September 19 a car on the electric railway at Bradford, Eng., was overturned at the foot of a steep grade, where there was a sharp curve, with the result that one man was killed and 15 persons seriously injured.

Major Cardew has investigated the accident on behalf of the Board of Trade and in his report says that the causes of the accident were: "(1) That the cars were not run within the limit of speed required by my report to the Board of Trade—namely, not exceeding six miles an hour on the down journey. (2) The unfortunate combination of a driver with very little experience and a conductor with none at all, but with a little knowledge, which is a proverbially dangerous thing; slippery road and extra pressure on traffic, due to Barnum's show. The driver certainly used the brake power provided in an injudicious manner. The conductor put on the hand-brake, and thus deprived the driver of the full control of the brake power; and he also caused the trolley to be disconnected, thus depriving the driver of the power of reversing, which might have prevented the accident. I consider the brake power ample, and that by means of the graduation of the electric brake the speed can be regulated with ease and certainty, provided that a speed of six miles an hour be not exceeded. I approve of the addition of a slipper brake, as recommended by the coroner's jury, not, however, as an emergency brake, but as a brake to be continuously in use, since by it also exact regulation of speed can be obtained, and its use will diminish the strain on the motors and the excessive wear of the wheels. With reference to another

recommendation of the coroner's jury in this case—namely, that two sand-boxes be fixed to each platform to enable the driver to sand both rails—I think these should be arranged so that one can be used alone, otherwise difficulties may be caused on the up journeys from occasional loss of electrical contact with the rails. It would, perhaps, be more judicious to station men to attend to the sanding of both rails at the dangerous points on the down journey. I adhere to the opinions expressed in my report of inspection that the speed of the down journey should not at any point exceed six miles an hour, and that trailer cars should not be allowed on this line, and provided that the requirements of that report are complied with I recommend that the line should be certified by the Board of Trade as fit for traffic. It must be fully recognized, however, that on this line the greatest caution and strict attention to regulations are essential to safety. The time occupied on the down journey should be at least 35 minutes, and more time should be allowed for this than for the up journey. I wish to add that although the accident was in great measure due to the inexperience and injudicious action of the driver and conductor, in my opinion they both did their duty to the full extent of their skill and ability."

Tests with the brakes were made by Maj. Cardew, from which "it appears that the slipper brake alone, as now fitted, is the least effective of all as an emergency brake. This is, I consider, to some extent due to the flat pitch of the screw by which the brake is applied, but considering the small fraction of the whole weight of the car that can be possibly brought to bear upon this brake, I doubt greatly whether it can be made as effective an emergency brake as the other brakes which act upon all the wheels, and which therefore bring into play as a retarding force a friction due to the whole weight of the car. It has, however, an advantage in that it applies a surface of wood to the steel rail, the co-efficient of friction between wood and iron or steel being generally greater than that between iron and iron. The fact is that if a car be allowed to acquire such a speed as 20 miles an hour on a steep gradient, no brake acting by friction on the running rails will stop it in a distance that could be considered safe."

### PARKS IN KNOXVILLE.

The street railway companies of Knoxville, Tenn., have all been consolidated and this year a large sum was spent in developing the parks. Knoxville is a city of 45,000 population and closely built so that a considerable part of the citizens walk instead of using the cars.

About a year ago C. C. Howell, vice-president and general manager of the Knoxville Traction Company, tried the experiment of placing simple amusements in some of the parks which had been sadly neglected and devoid of all attractions. The receipts of the system were so greatly increased that it was decided to develop the parks and induce the people to patronize them.

Last spring the company fitted up a park for white patrons exclusively and afterwards bought a park for the colored people. Although the work on the parks was by no means completed, yet considerable revenue was derived from their operation. The soldiers being in the city during the summer interfered with the park plans. The management intends to put the parks in first class condition for next year, and while plans have not yet been completed for the lines of amusement, these will be attended to early in the year.

### TOLEDO TRACTION MEN ENTERTAIN.

A most enjoyable entertainment was given in Calvin hall, Toledo, on November 10, by the Traction Company Centennial Band, which is a social organization of employes of the Toledo Traction Company. It comprises 25 good musicians; A. A. Atkinson, solicitor for the company, is the manager.

During the early part of the evening the band rendered a musical program and this was followed by dancing. Thomas H. McLean, general manager of the company, and Mrs. McLean, led the grand march. Other of the officials were also present. The refreshments included a barrel of sweet elder, sandwiches and cake, all of which was provided by Mr. McLean.



## SERVICE STRIPES FOR BOSTON ELEVATED.

By the courtesy of C. S. Sergeant, second vice-president of the Boston Elevated Railway Company, we have received copies of the orders issued November 4, 1898, providing for service stripes on the uniforms of employes. General Order No. 68, to all uniformed car employes is as follows:

"The regulation uniform of car service employes, namely: conductors, motormen, inspectors, starters, transfermen, subway station-masters, guards and collectors, will hereafter require the addition of a service stripe on each sleeve of the coat and uniform overcoat for each five years of service in the employment of this company or of any street railway company now forming a part of the system operated by the Boston Elevated Railway Company.

"The service stripe will be one-fourth inch in width, of silver braid for motormen and gold braid for all other employes concerned, and the first stripe will be affixed four and one-half inches from the edge of cuff on the inside seam of sleeve and nine inches from the edge of cuff on the outside seam of sleeve, additional stripes to be affixed with one-fourth inch spacing.

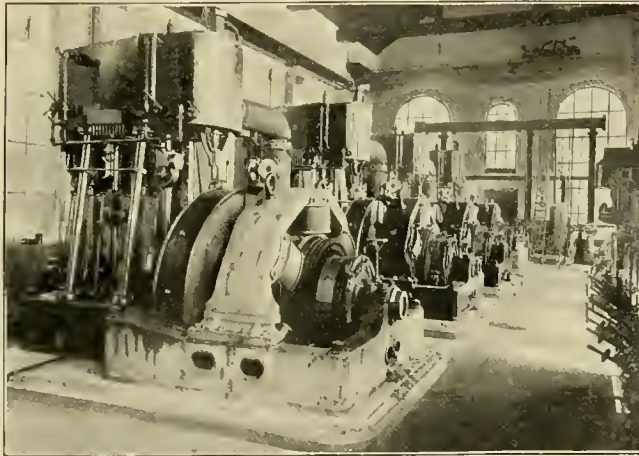
"Arrangements have been made by which all employes now

## INTERURBAN BETWEEN BLACKPOOL AND FLEETWOOD, ENGLAND.

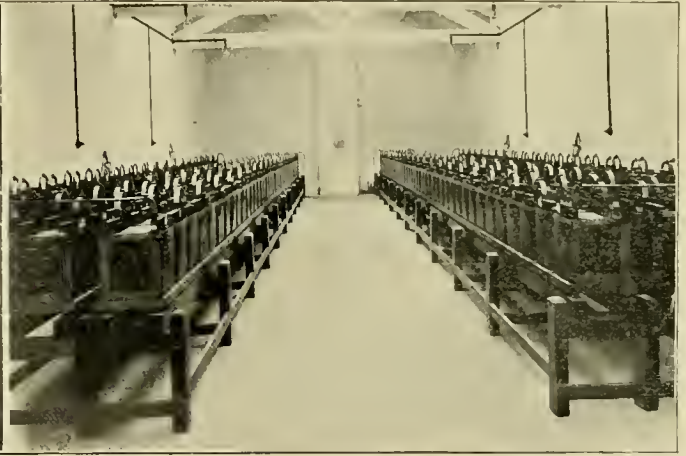
During the past few years the promoters of electric railways in Great Britain have placed so much reliance upon American experience that American practice has been closely followed; even the greater part of the equipment coming from the United States. This, however, is not true of the recently completed Blackpool & Fleetwood Tramway, as it is for the most part an English product, the designs, specifications and equipment being furnished by Mather & Platt, of Manchester.

This line is purely an interurban joining the seaside resort of Blackpool, a city of 24,000 inhabitants, with the port of Fleetwood, a city having a population of about 10,000. These two cities are on the Irish sea north of Liverpool. By reference to the map it may be seen that the line leaves the railroad station in Blackpool and soon reaches a point within view of the sea. It then follows a road along the cliffs and passes to right of the storage battery sub-station. The route goes through Bispham, Norbreck, and then leaves the coast and strikes inland through Cleveleys, Rossall, past the second storage battery sub-station and enters Fleetwood.

The section of the line in Blackpool, nearly a mile in length,



ENGINE ROOM.



STORAGE BATTERY ROOM.

entitled to wear service stripes will have these stripes affixed to their uniforms without extra expense to them. Those becoming so entitled in the future will be expected to bear this expense from time to time as they may become entitled to additional stripes from length of service.

"All car service employes who have performed five years or more of service will at once make application to their division superintendents, stating date and place where they first entered the service and for what company, giving the necessary information by which the number of stripes to which they are entitled may be determined. It should be noted that the five years of service is not necessarily continuous service."

Other orders of the same date prescribe stripes of the same width of scarlet cloth for emergency linemen, and of green cloth for switchmen and subway watchmen. Switchmen and watchmen are also "required to wear in the winter season a uniform ulster of gray frieze and cap of the same material, upon which will be affixed the proper badge, and which will be provided with the uniform buttons similar to those worn by motormen."

The Topeka (Kas.) Railway Company, at one time the largest electric road in the world, and now one of the oldest, is still using the original equipment. The light girder rails are proving very unsatisfactory and it is hoped to replace them by 45-lb. T-rails as soon as the city authorities can be made to see the value of such a change.

is of single track, with turn-outs, and is laid with 98-lb. grooved girder rails. The trolley wires are suspended from ornamental side arm poles except in a few cases where span wires are used. After leaving the city the line becomes double track and the wire is suspended from center double arm poles. The 56-lb. rails are laid upon sleepers and joined by plastic bonds which were imported from the United States and made by Harold P. Brown. This track construction continues for 6½ miles, but in Fleetwood the grooved rails and the copper bonds are again used. The line is 8 miles in length, with a total of 16 miles of single track. The trolley wires are double throughout the entire length, thus avoiding all switches and frogs. As will be noted in the illustrations the iron poles are of ornamental design and have a pleasing appearance.

Power is supplied to the circuit from the station by four feeders, which are wire cables, lead-covered and laid in conduits. The feeders are connected through wedge switches in cast iron feeder boxes to each section of the trolley line. The buildings of the company are located at Bispham, about a quarter of a mile from the main line and connected to it by a siding. The power station and the car barns are included in one structure. In the boiler room there are three Lancashire boilers, each 30 ft. long and 8 ft. in diameter, an economizer and two steam driven pumps supplying feed water from a hot well. The boilers maintain a pressure of 120 lbs. and furnish steam to four open marine type vertical compound engines, each with cylinders 12 and 24x16 in.; speed 180 r. p. m. Upon each bed-plate and direct

connected to each engine is a multipolar, 120-k. w. 500-volt generator, of Mather & Platt make. The operation has so far proven satisfactory and the machines run sparkless both at minimum and maximum loads. The efficiency of the dynamos is 93 per cent, and they run continuously on full load with a rise in temperature in the armature not to exceed 25 degrees C.

The steam and exhaust pipes are carried beneath the floor in the basement. The main steam pipe is of steel and fitted with



MAP OF INTERURBAN LINE.

a separator, dry steam being delivered to the cylinders. Ejector condensers are provided, the condensing water being obtained from a storage reservoir at the rear of the station. The engine room has a 5-ton traveling crane.

The switchboard consists of five slate panels, two for the generators, two for the feeders and one for the testing instruments and station switches. By means of suitable switches any feeder may be connected to a booster, by which the voltage at the feeding point on the line is kept automatically constant. This enables the dynamos to run parallel and all the feeders to be of the same size.

Each of the three boosters is a four-pole motor connected direct to a four-pole dynamo on the same bed-plate. The motor is connected to the bus-bars, and the speed may be varied to suit the voltage required by means of a resistance inserted in the shunt windings. With the booster the storage batteries may be charged independently of the line.

There is a storage battery station near each extremity of the road. The battery consists of 250 cells, made by the Chloride Electric Storage Syndicate, and is capable of an output of 300 ampere-hours at 500 volts. Besides regulating the voltage on the line and providing for sudden demand for current the batteries furnish power independently of the generating station for early morning and late night trains, thus permitting the station to be shut down over much longer periods than would other-



POLES AND OVERHEAD CONSTRUCTION.

which would be the case when the cells were being charged. The storage battery switchboard is fitted with a recording voltmeter, measuring the drop in the rails, ammeter and a wattmeter which registers the charge and discharge of the battery.

At the Fleetwood storage battery station there is provision for housing 10 cars. In the car barn at the power station there is room for 12 cars, and pits for four cars to be inspected at once. There are a number of machine tools for repairs in one end of the barn. All the buildings are lighted with incandescent lamps, receiving current from a switchboard panel in the central station.

The rolling stock comprises 16 open motor cars, eight closed motor cars and three trailers. Each motor car is 34 ft. 6 in. long and mounted on two bogie trucks with 28-in. wheels. Each car carries 48 passengers and weighs, loaded, 12 tons. Each truck has a 35-h. p. motor, giving sufficient power to operate the cars at 25 miles per hour. The gear reduction is in the ratio of 4 to 1. Each car has two series-parallel controllers and an automatic device to prevent an excessive current passing. The cars are lighted with incandescent lamps and are handsomely finished.

### OFFICIAL REPORT OF THE BOSTON CONVENTION.

The verbatim report of the seventeenth annual convention of the American Street Railway Association at Boston was published and mailed to the members early in October. The report comprises 255 pages and in arrangement and typographical appearance is a credit to the Association and to Secretary Pennington.

The frontispiece is a steel engraving of ex-President Albion E. Lang, who presided so well over the Boston meeting. The toasts at the banquet are given in full. The size of the report is indicative of the growth of the Association.

### ELECTRICAL EXHIBITION IN 1899.

At the annual meeting of the stockholders of the Electrical Exhibition Company, held on November 21, it was unanimously decided to hold another electrical exhibition in New York in 1899. The election resulted as follows: President, C. O. Baker, Jr.; vice-president, F. W. Roehling; secretary and treasurer, George F. Porter; general manager, Marcus Nathan; directors, H. H. Harrison, L. F. Roqua, J. W. Godfrey, C. A. Lieb.



TYPE OF CARS.

wise be the case. The two batteries will furnish current for 100 car-miles, or six round trips.

The arrangement of the switchboard enables the cells to be connected in parallel with the overhead wire, or the feeders alone may be directly connected with the line, or the battery disconnected with the line and coupled direct to the feeder,



## AN ELECTRIC RAILWAY FOR VICKSBURG.

Mississippi can boast of but one electric railway system and that is only six miles in length. Although the state has approximately a million and a half of population, there are no large cities and few of any importance. Vicksburg is the chief city, having a population of 25,000, and has been without transportation facilities.

The Vicksburg Railroad, Power & Manufacturing Company was organized to supply the city with electric current for lighting, power and traction purposes. The company has possession of the present lighting system which includes 150 arc lamps and a comparatively small number of incandescent lamps. The municipal authorities granted the company a 50-year franchise with the privilege of conducting a street railway, power and lighting business. Passengers, freight and mail may be carried on the electric railway. Exclusive right of way is given in all the streets in the city or those which may become a part of the city. A similar franchise was granted by the commissioners of Warren county.

The power plant is now being reconstructed and the new arrangement of the machinery is shown on the floor plan. A 22x42-in. corliss engine is belted to a jack shaft from which five arc machines and two small alternators are driven. These machines will continue in service. A 500-h. p. tandem compound condensing corliss engine will be added, and this will be belted to the shafting, which is divided into sections by friction clutches. Two railway generators, one of 180 k. w. and the other of 250 k. w. capacity, will be installed and two more alternators for lighting and power service. The lighting machinery will then be capable of running 250 arcs and 5,000 incandescent lamps. In the boiler room the 200 h. p. of Heine boilers will be reinforced by 400 h. p. in addition.

The station is alongside the lines of the Vicksburg & Meridian

Railroad, and coal is delivered from the cars at the boiler room door. The location of the station is indicated on the map of the city, which also shows the arrangement of the street railway lines. There will be six miles of track with 10 motor cars in service, each of which is to be equipped with two 35-h. p. Westinghouse motors. The Westinghouse Electric & Manufacturing

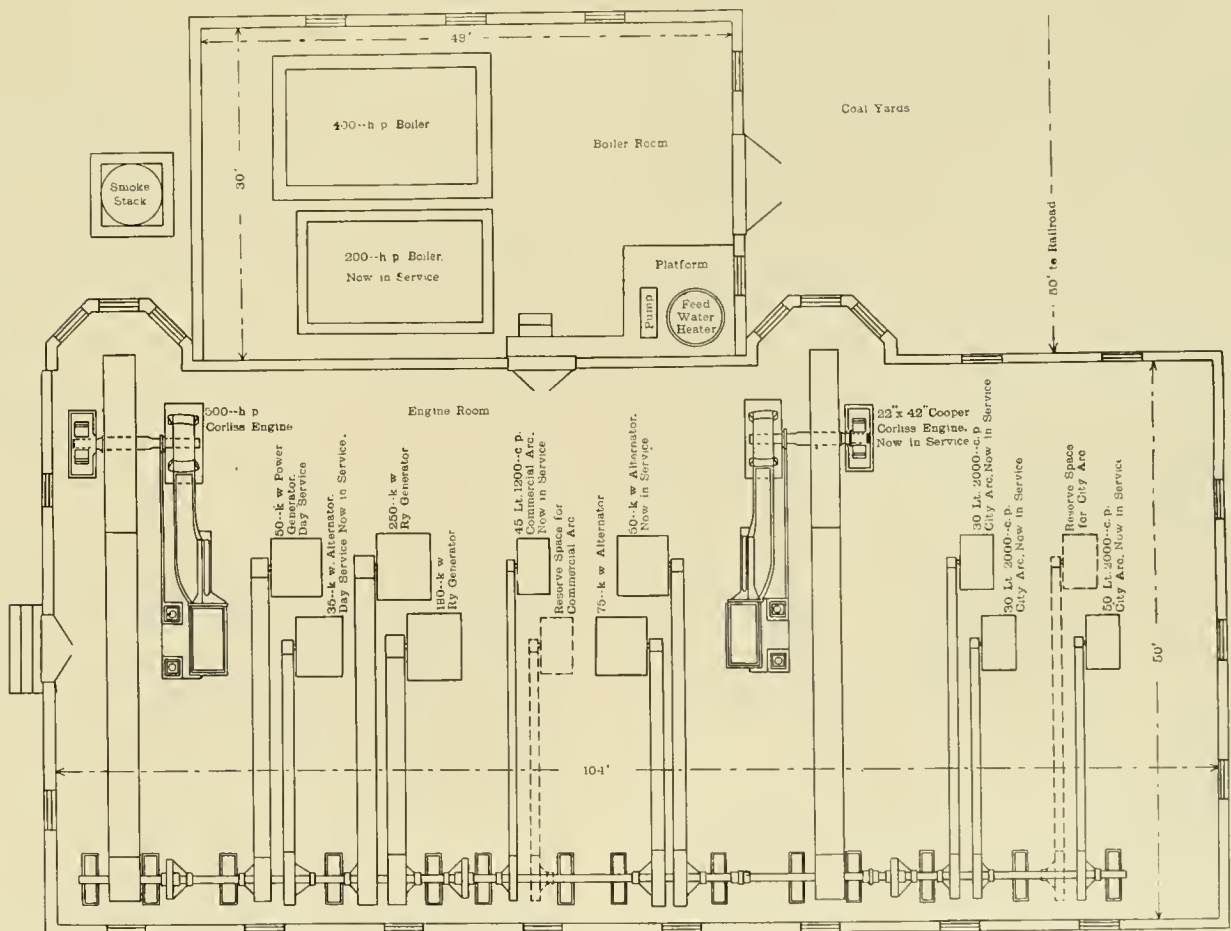


MAP OF VICKSBURG.

Company is supplying all the electrical machinery in the new installation.

As the traffic will be light, 45-lb. T-rails, made by the Johnson Company, will be laid and bonded with Chicago bonds. The North American Railway Construction Company, of which A. S. Littlefield is president, has received the contract for building the road. Work is in active progress and the system will be completed and in operation by April 1.

The company has procured a 50-acre tract of land which will be improved for a pleasure resort. As the summer season is practically nine months long it is thought that a well conducted resort, with popular amusements, will prove a great attraction and stimulate traffic. Vicksburg, itself, has many historic asso-



PLAN OF POWER STATION.

ciations, and some evidences of the siege of 1863 still remain. One of the national cemeteries is located near the city.

The officers of the company are as follows: J. C. Shaffer, president; S. R. Hughes, vice-president; M. J. Mulvihill, secretary; B. W. Griffith, treasurer; S. F. Mordaunt, general manager. All the officers are residents of Vicksburg except Mr. Shaffer, whose office is in Chicago and who has been largely instrumental in bringing success to the plans of the company.

### RAILWAY MILEAGE IN FOREIGN AND AMERICAN CITIES.

The "Surveyor," of London, printed the following interesting figures on the cost of operating trolley lines, and the tables giving the miles of track and population per mile of track in American and European cities. The figures for the cities in the United States have been revised to conform with later statistics.

"Quite recently there has been considerable agitation as to what it really costs to work an overhead tramway system. It has been maintained for a long time that the average cost should be about 12 cents per car-mile. There are many examples of the cost being much lower than 12 cents and a few cases where it has been higher. The Brussels line, equipped with the overhead electric system, cost 9 cents; Dresden, which possesses two systems of electric tramways, cost in one case 12 cents per car-mile and in the other 7.72 cents; Remscheid electric lines cost 8 cents per car-mile, and, to quote an instance from America, the railroad commissioners of the state of Connecticut showed in some recent figures that the average cost per car-mile on nine electric tramways was 11 cents.

"It may, with some reason, be urged that these figures have very little significance in this country, because they probably do not represent the conditions that generally obtain here. It is not, however, a matter of great difficulty to secure returns from the lines that have been working for some time in the United Kingdom. On the old electric tramway line of Leeds, which was put up when practically very little was known about the economical working of tramways, the cost per every car-mile run was about 11 cents; but, to come to more recent examples, we can quote that of Bristol, where electricity has been employed on difficult sections of the Bristol Tramway Company's lines, sections, moreover, that hitherto were impossible for horses to work, yet the cost per car-mile has been shown to be no more than 11 cents. This is an interesting example, because one has an opportunity of comparing that figure with what the horse lines cost in the same city, and from last year's report we find that the horse lines have cost 19 cents per car-mile. At Coventry the economical nature of an electric tramway service has been amply demonstrated, and the curious part about this is that previous to the institution of the electric system there tramway systems of any description had been complete failures and two companies had gone into liquidation in their attempts to provide the people of Coventry with a tramway service. The electric tramway company of that city has not only been able to declare a dividend of 8 per cent, notwithstanding that the line passes through sparsely-populated districts, but has been able to demonstrate that the cost of working the line is not more than 12 cents per car-mile.

"We can give a still more favorable illustration in the case of the Dover Corporation tramways, which have been for the past four or five months worked on the overhead wire system. The borough engineer says that the cost per car-mile is only 11 cents; and this is very important, because the conditions prevailing in Dover are not altogether ideal ones for the economical working of an electric tramway system, as the necessary electrical energy to work their service is purchased from the local electric lighting company.

"Therefore, out of the few electric systems at present in use in this country, it can be shown that on four lines at least the total cost of working is under 12 cents, a state of things that ought to demonstrate that electricity is certainly the most economical agent for tramways, because it can be said from figures that are open to everybody that the horse lines of this country average 18 cents per car-mile, while steam lines rarely cost less than 22 cents, and in some cases more. Some recent figures

relating to the comparative cost of various systems of traction in Paris are interesting, and they show us that horses cost 17.10 cents; accumulators, 16.66 cents; steam locomotives, 10.78 cents; and the overhead trolley system, 9.24 cents per car-mile. These figures ought to be convincing, because the overhead system in Paris has certainly not had particularly fair play.

"It is interesting to note the relation of tramways to the population in some of the chief American cities, some European and those in the United Kingdom. They will, at any rate, show that there is considerable room for extending the tramway systems, and thus make them more popular vehicles than they have proved to be in the past."

#### RATIO OF TRAMWAY MILEAGE TO POPULATION.

Town.	Population.	Miles of Population per	
		Track.	Mile of Track.
Berlin .....	1,860,000	180	10,000
Paris .....	2,500,000	184	13,587
GREAT BRITAIN AND IRELAND.			
Glasgow .....	\$40,000	73	11,507
Liverpool .....	60,000	60	10,000
Manchester .....	520,000	50	10,400
Bradford .....	216,400	21	10,304
Bristol .....	221,600	18	12,311
Cardiff District .....	120,000	2.33	55,364
Leicester .....	174,000	9	19,411
Newcastle and Gosforth .....	186,200	13	14,330
Nottingham .....	213,300	19.25	20,863
Sheffield .....	324,300	9	36,003
Sunderland .....	131,000	5	26,200
Aberdeen .....	109,800	10.25	1,702
Dundee .....	153,000	7.25	21,163
Edinburgh .....	256,400	13.5	19,000
Belfast .....	256,000	20	14,800
AMERICAN.			
Greater New York .....	3,380,000	1,050	3,200
Chicago .....	1,875,000	1,020	1,400
Philadelphia .....	1,250,000	500	2,500
St. Louis .....	650,000	370	1,700
Baltimore .....	625,000	430	1,500
Boston .....	550,000	480	1,150
Cleveland .....	385,000	330	1,100
Buffalo .....	300,000	220	1,500
Detroit .....	320,000	240	1,330

### REPORT OF THIRD AVENUE, NEW YORK.

The financial statement in the report of the Third Avenue Railroad Company, of New York, contains the following figures:

Surplus, Nov. 1, 1897.....	\$ 258,332.20
Receipts from car passengers, year ended Oct. 31,	
1898 .....	2,359,799.33
Receipts from other sources.....	42,315.91
Total, including surplus.....	\$2,660,447.44
Operating expenses .....	1,280,465.41
	\$1,379,982.03
Taxes .....	\$119,577.52
Bond interest .....	250,000.00
	369,577.52
	\$1,010,404.51

During the past year \$800,000 was paid in dividends, and a dividend of 1 $\frac{3}{4}$  per cent was declared on \$12,000,000, the present capital, for November, 1898.

During the year consents of abutting property owners and of the railroad commissioners were obtained for the change of motive power on all the lines of the company in the Boroughs of Manhattan and Bronx; the change was begun on the lines of the Forty-second Street, Manhattanville & St. Nicholas Avenue Railway Company and is now being proceeded with.

The work of reconstruction is also in progress on Broadway between 45th and 59th streets, a large force of men being at work.

Street car service was resumed in Tacoma between the city and Old Tacoma on October 29, for the first time since the fire, which destroyed the Tacoma avenue bridge.



## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

**Priority of Lien for Labor and Material for Improvements and Repairs.***Sioux City Electrical Supply Company v. Sioux City & Leeds Electric Railway Company (Ia.), 76 N. W. Rep., 838. Oct. 25, 1898.*

Conceding that the labor and material for which a lien was claimed in this case were all for improvements and repairs, and that, therefore, the lien did not attach from the commencement of the construction, yet, being furnished before the execution of the deed of trust, the supreme court of Iowa holds that the lien is entitled to priority over the deed.

The court further holds that the rule that the lien of a mortgage is presumed to continue until the debt is paid, and that a change in the form of the evidence of the debt, such as substituting new notes or bonds, does not extinguish the lien, has no application where the security is canceled upon the records, all presumption as to its continuance ending with such cancellation, so that, as to third persons, it is as if no such security had ever been given.

**Who Owns the Costs?***Taylor v. Long Island Railroad Company (N. Y.), 53 N. Y. Supp., 830. Oct., 1898.*

This was a motion by the plaintiff to compel her attorney to pay to her \$477, the costs and allowances recovered in this action, wherein she obtained a judgment for \$7,500 damages for the negligent killing of her husband, \$102 costs exclusive of disbursements, and an extra allowance of \$375. She had retained her attorney by a written agreement that he was to be paid 30 per cent of the "amount recovered," but nothing if he failed "to collect damages." The attorney paid her 70 per cent of the damages, and retained 30 per cent and the costs and allowances.

The decision of the special term of the supreme court of New York, Kings county (Gaynor, J.), after severely criticizing the cases on which the attorney based his contention, is that the party owns the costs, and his attorney has a lien thereon for his unpaid services. When he is paid, the court says, his lien ceases. Nor are the taxable costs the measure of his compensation. He may be entitled to less or more than the taxable costs.

Here, continues the court, the compensation of the attorney was fixed by agreement, and he could claim no more. The amount agreed upon included everything he was entitled to, and he had no lien beyond that. But the plaintiff was not entitled to all of the costs and allowance, but to 70 per cent only. They were part of the "amount recovered."

**Cannot Insist on Injured Person Undergoing Serious Surgical Operation.***Kehoe v. Allentown & Lehigh Valley Traction Company (Pa.), 41 Atl. Rep., 310. Oct. 17, 1898.*

The entire burden of the (unavailing) defense in this case was practically made up of these two propositions: (1) That the injury complained of was not the result of the accident alleged; and (2) assuming that it was, then the injury was not of a permanent character, but one that could quickly and permanently be cured by proper medical treatment, namely, by a simple surgical operation, attended with no pain (if anaesthetics were used or the patient etherized), and free from serious danger.

It was, of course, incumbent on the plaintiff, says the supreme court of Pennsylvania, to prove that the personal injury of which she complained was the direct result of the defendant company's negligence.

But, in view of the evidence relating to the subject, which, however, it does not set forth, the court is just as positive that there cannot be any doubt of the correctness of the following instructions given the jury, namely: (1) That if they believed

that the surgical operation, necessary to relieve or cure the plaintiff, was a serious or critical operation, necessarily attended with some risk of failure, then the plaintiff was not bound in law to undergo a serious and critical surgical operation, which would necessarily be attended with some risk of failure; and (2) that, if they believed that such operation was dangerous and critical, and attended with risk of failure, she was privileged to exercise the liberty of choice, under such circumstances, as to whether suffering and feebleness, resulting from the injury, would be endured, or whether the surgeon's knife should be used.

**Rights and Duties of Man in Top Buggy.***Louisville Railway Company v. Stammers (Ky.), 47 S. W. Rep., 341. Oct. 12, 1898.*

This "not-to-be-officially-reported" case was brought to recover damages for personal injuries. The plaintiff Stammers was driving in a top buggy along a street in Louisville at about 11 o'clock at night, when he was run upon from the rear by one of the company's electric cars, his buggy being knocked off the track, and he himself considerably bruised and cut. His suit for damages resulted in a judgment for \$500, which the court of appeals of Kentucky affirms.

The proof conducted to show that the plaintiff was driving along the track, the wheels of his buggy straddling it, and that no alarm was given of the car's approach and proximity to him until too late for him to get off, or for the car to be stopped.

Under the instructions given the jury, the plaintiff was entitled to recover damages if the motorman failed to give notice of his approach, and use ordinary care to avoid collision, but, if the injury resulted from the plaintiff's own negligence, no recovery could be had. The man in the buggy was also to use ordinary care, and give the right of way to the car on its approach; and, if he failed to use ordinary care to avoid collision, he was precluded from recovery. If, as contended by the company, the man was not driving on the track, but, just before the collision occurred, suffered his horse to start across the track in front of the moving car, he could not recover, under the instructions.

The court of appeals holds that the case was fairly submitted to the jury.

**Guess at Rate of Speed Not Sufficient to Establish It.***Smith v. Holmesbury, Tacony & Frankford Electric Railway Company (Pa.), 41 Atl. Rep., 479. Oct. 17, 1898.*

A man, driving a horse attached to a cart in which he was riding, on seeing a trolley car approaching from behind, turned out and drove along the side of the track. When the car was within 75 or 100 feet of him his horse appeared to be frightened by it, and commenced prancing and shying. The man testified that as the car came down to him the horse "flew around into the gutter," and then "the horse flew back, and the car struck the cart as the horse flew back." He also testified that the speed of the car was not "less than 15 miles an hour," and that when the cart and car collided he was thrown over the side of the former to the ground, and received the injury of which he complained. In the court of common pleas he obtained a judgment for \$5,000 for personal injuries attributed to the excessive and unlawful speed of the trolley car. But the supreme court of Pennsylvania reverses the judgment of the lower court, holding that, the plaintiff having failed to establish the negligence charged in the statement of his claim, the court should have instructed the jury to find for the defendant. The negligence alleged in the statement of his claim was the running of the car at "a very rapid and unlawful rate or speed." There was no corroboration of his testimony in regard to the speed of the car, and the supreme court declares that he completely failed to prove the negligence charged in his statement, a mere guess or

conjecture respecting the rate of speed not being sufficient to establish it, that being all that his testimony in regard to it amounted to. There was no presumption of negligence, the court further says, arising from the accident, so that it was essential to the maintenance of the suit that it should be established by competent evidence.

#### Rules for Employes Are in No Way Binding upon Third Parties.

*O'Keefe v. Eighth Avenue Railroad Company (N. Y.), 53 N. Y. Supp., 940. Oct. 7, 1898.*

This was an action brought to recover damages for the fracture and permanent injury of the plaintiff's right arm, which was run over by one of the wheels of a heavily loaded truck, which the plaintiff himself was driving, his contention being that he was violently thrown from his truck in consequence of a collision with one of the defendant's street cars, which was negligently driven around a curve.

The plaintiff recovered a judgment, which the first appellate division of the supreme court of New York affirms, with costs, holding, for one thing, that the refusal of the trial court to admit in evidence the rules of the company as to the duty of the driver with respect to the rate of speed in rounding curves was proper, because in no way could they be binding upon the plaintiff. Nor does it think that it was material or relevant, in answer to the charge that the car in this instance had gone around in a careless manner and at a high rate of speed, to show that the rules of the company forbid such management of the car while rounding a curve.

Considering the nature of the injuries, the plaintiff's age, which at the time of the accident was about 25, and the probability of the duration of life, the court further holds that it cannot be said that the loss of the use of his right arm, and the suffering which was entailed as a result of the injury, were excessively compensated for by the verdict of \$8,000, though the plaintiff is now earning, as a bookkeeper, as much as he formerly earned as a truckman, it being shown that he had lost the use of his right arm, and that it was subsequent to the accident that he learned to write with his left hand, and was thus enabled to earn a livelihood.

#### Parental Neglect Defeats Action for Injury to Child Playing Out at Night.

*Juskowitz v. Dry Dock, East Broadway & Battery Railroad Company (N. Y.), 53 N. Y. Supp., 992. Oct., 1898.*

According to the evidence in this case, the parents of the plaintiff, a child 3½ years old, allowed it to play upon the streets at night, uninstructed as to the dangers and unattended by a care-taker of suitable age and discretion. The defendant's cars passed the parents' door at short intervals during the day and night, constituting a source of danger to unsuspecting children. The child, from want of discretion, was injured by one of the passing cars. The injury occurred on Sunday evening, when the stores were closed and the street was darker than on other nights.

Under these circumstances, the trial term of the supreme court, New York county, says that the legal conclusion seems inevitable that the failure of the parents to exercise reasonable caution and care contributed to the injury, and must defeat the action. Indeed, any finding of due care on their part, it thinks, would, under the circumstances, have to be set aside.

There was a total absence of prudence and care in this instance, the court reiterates, while it points out that the cases relied upon by the plaintiff were exceptional, and those in which the injured child had been properly instructed by its parents, escaped their vigilance, disobeyed instructions, was of mature years, or the accident happened in broad daylight. Such variances, slight as they may seem, it continues, play their part in negligence cases, each of which must be decided upon its own peculiarities, and it insists that if the rule imputing to children of tender years the negligence of their parents does not apply to this case, it is difficult to imagine any one to which it would apply.

#### Repudiates Doctrine of Imputing Contributory Negligence of Parent to Child.

*South Covington & Cincinnati Street Railway Company v. Herrklotz (Ky.), 47 S. W. Rep., 265. Oct. 5, 1898.*

Here the court of appeals of Kentucky affirms a judgment of \$2,500 for the so negligently injuring of a child that its left arm had to be amputated at a point about two inches below the elbow.

Furthermore, the court concludes that, in view of certain authorities which it cites, as well as upon sound reason and principle, a child less than four years of age cannot be guilty of contributory negligence.

But strenuous effort was also made to induce the court to impute to the child the contributory negligence of its parents, and this, the more, because it was said that the question as to whether the negligence of the parent can be imputed to the child in suits to recover on its own behalf for injuries had never been directly decided by this court.

The court concedes that quite a number of the courts of last resort have decided that in actions by infants to recover for injuries sustained by them the negligence of the parent can be imputed to the child, and its recovery thereby defeated; but it says that it seems to it that it is not consistent with reason nor the principles of equity. To say that an infant incapable of controlling its own actions, or judging of what is proper, prudent, or right, should be deprived of the right to recover for injuries inflicted upon it through the negligence of others simply because its parent or custodian had failed to discharge the duty resting upon him, the court goes on to state, seems to it absurd, and opposed to natural justice.

Quite a number of cases are cited wherein other courts of last resort have repudiated the doctrine sought to be implanted in Kentucky, and the court of appeals closes the discussion with the statement that it is clearly of the opinion that the negligence, if any, on the part of the parents of the plaintiff cannot be imputed to the plaintiff when it is shown with the view of defeating or lessening the recovery.

#### Measure of Damages for Construction of Road in Cut Afterwards Bridged.

*Denison & Pacific Suburban Railway Company v. Smith, 47 S. W. Rep., 278; Denison & Pacific Suburban Railway Company v. Evans, 47 S. W. Rep., 280 (Tex. Cir. App.). May 14, 1898.*

In this last named case, since the above date, the supreme court of Texas has denied a writ of error. Both suits were instituted to recover damages alleged to have been caused by the construction of a road in a cut in a street adjacent to property owned by the respective plaintiffs, Smith and Evans.

In the first case, the court of civil appeals of Texas holds that a lienholder is not a necessary party where the property, after the damage, is ample security for the debt; that when the defendant desires to raise the question of nonjoinder of parties, it must do so by plea in abatement; and that, in Texas, the title to mortgaged land remains in the mortgagor, so that the allegation of ownership of the land by the plaintiff is not disproved by showing a valid outstanding lien upon the land in a third party.

In the second case, the court holds that it was not error to refuse to give the special charge asked by the defendant to the effect that "any amount still due on the notes mentioned in the deed to plaintiff and his wife should be deducted from the amount of damage to the property," the defendant having failed to ask, by its pleading, any relief by reason of the lien existing upon the property, or that the holder thereof be made a party, that his rights might be adjudicated in the suit.

In both cases it was urged that there was error in the charge to the jury that the measure of the plaintiff's damages would be the difference in the value of the property just before and just after the construction of the defendant's road, particularly because some time after the road was constructed in a deep cut made therefor a bridge was built across the cut; but the court holds that, under the circumstances of each case, no error was committed.



The court says, in the second case, that ordinarily the rule as to the measure of damages is the difference in the value of the property immediately before and immediately after the injury received, and it sees no reason why a different rule should prevail here, there being no plea that the building of the bridge diminished the damages, nor any evidence introduced to show that the construction of the bridge diminished the damage to the plaintiff's property.

#### Company Liable for Negligence of Track Foreman.

*Chattanooga Electric Railway Company v. Lawson (Tenn.), 47 S. W. Rep., 489. Oct. 22, 1898.*

"Suit by children for damages for the negligent killing of their father. Declaration has two counts; first averring general negligence of the railway company, and second negligence resulting in giving sudden order obeyed in an emergency. Judgment for plaintiffs for \$6,000, motion for new trial overruled, and appeal in error. Judgment affirmed."

Such is the somewhat brusque beginning and ending of the brusque opinion prepared by Mr. Chief Justice Snodgrass, for the supreme court of Tennessee

The trial judge, it is said, had charged correctly, that, to justify effort to obey order of a superior in a hazardous matter, the order must be immediate and upon a sudden emergency or exigency. There was no such immediate order, and, the court holds, plaintiffs were not entitled to recover on that count

The whole case thus came to turn upon one point—whether, under the evidence, the track foreman, by whose negligence the injury, it was contended, was occasioned, was the superior of the deceased, in the sense of a vice principal, and was or not his negligence, if proven, personal or official. And notwithstanding the labored effort of counsel to make it appear otherwise, the court declares that, whatever the doctrine may be elsewhere, it is clear that in Tennessee a section boss or track foreman is a vice principal, and for his negligence while acting officially for the master the master is answerable

It was one of a gang of track hands who was killed. Evidence believed by the jury showed that the track foreman commanded him as a subforeman, to take four or five men, catch a trolley and attached flat car as they passed, and go to their destination, and unload them. It was upgrade, and the foreman, who was running the cars, would not stop. On the fatal trip, and while the cars conducted by the foreman were going at the rate of three or four miles an hour, the employe attempted, in obedience to order before given, to get onto the front platform, caught on an iron rod or hand railing about the platform, slipped, and was swung around in front of the car. He held on for some distance, somewhere from 15 to 45 feet, and then fell on the track, was run over and killed. There was evidence tending to show that the foreman could have stopped the cars from the time he swung round until he fell; though also, it is said, "of course," there was evidence to the contrary

The danger of the effort to get on was not, at most, very great, and the court holds, it could not be said as a matter of law that it would prevent recovery. The question was one for a jury, as well as its effect (if not the proximate cause of the death), in mitigation of damages.

And the court holds that the negligence of the foreman was official, in contradistinction to personal. What he did or omitted to do, therefore, if negligent, it insists, was the master's (company's) negligence; and, that the jury had the right to find that running by without stopping before or after the deceased caught the car, having given orders to board the cars while in motion, was negligence, and that it was official.

#### Unskillfulness of Overhead Crossings Not to Be Considered.

*Pennsylvania Railroad Company v. Warren Street Railway Company (Pa.), 41 Atl. Rep., 331. Oct. 17, 1898.*

The supreme court of Pennsylvania here says: "In all of our recent utterances respecting grade crossings of railroads, we have expressed ourselves with an increasing emphasis against their allowance, and with a most earnest purpose to 'prevent' them wherever it is 'reasonably practicable to avoid' them. We con-

sider it to be our plain duty, in order to conform with the express letter of the act of 1871, and to effectuate the prudential considerations, and the manifest policy, which underlie the legislation upon this very important subject."

In this instance, there was no physical obstacle to the construction of the overhead crossing. It was entirely practicable. But the lower court considered that it would be an obstruction to the travel in the street, and therefore a serious inconvenience, and also that it would be very unsightly in appearance. However, as the street was 40 feet wide, and the trestle work but 16, there would be but 24 feet left in the clear for the street travel; and, as the whole distance to be occupied by the structure would be only 700 feet in length along the street, the supreme court does not think this would be so serious an inconvenience to the street travel as to destroy the reasonable practicability of the overhead crossing.

As to the unsightliness of the structure, the supreme court declares that it cannot be considered as of any consequence when weighed against all of the dangers of a grade crossing.

As the cost here would be only \$4,000, the court says that it goes for nothing as against the statutory prohibition. And as to the damages which might have to be paid to private owners, it holds that they are of too uncertain character and amount to constitute, in advance of any ascertainment, a reason for granting the grade, as against the overhead, crossing

Neither does the supreme court deem the consideration of the probabilities or the improbabilities of collisions, by reason of extraordinary precautions to be prescribed in the decrees, is any element in the determination of the question.

The one test imposed by the statute is the reasonable practicability of the overhead crossing. If that is established, other considerations, declares the court, become unimportant.

For these reasons, the supreme court here reverses the decree of the lower court in favor of the street railway company, and orders that it be perpetually enjoined against crossing the tracks of the railroad at grade.

#### Liability for Injury to Child Allowed to Ride upon Platform.

*Jackson v. St. Paul City Railway Company (Minn.), 76 N. W. Rep., 956. Oct. 26, 1898*

A boy eight years and four months old got upon the rear platform of a street car, intending to ride thereon to his home, several blocks distant. The car was in charge of the motorman, who also acted as conductor. It was of the ordinary kind, except that it did not have gates, having railings at the rear end of the car, and only one step to the ground. While sitting upon the platform with his feet upon the car step, the car started, and while it was running fast, the boy became dizzy, fell off, and was injured

And now the supreme court of Minnesota holds that merely getting upon the car and sitting down on the platform with his feet on the step was not prima facie evidence that the boy was a trespasser, and that whether he was a passenger or trespasser it was not error for the trial court to submit to the jury the question whether it was negligence on the part of the acting conductor to permit him to ride sitting in that position, while the car was running fast, the acting conductor knowing that the boy was on the car

The court says that there was plenty of room inside the car, and it declares that it was within the province of the acting conductor to compel the boy to go inside the car, or stop it, and put him off, so that, if he did not do so, the jury had a right to say that the conductor was guilty of negligence which was imputable to the company

There can be no question, continues the court, but that the child was riding in a place of danger to life and limb. Yet just what degree of intelligence and prudence could be expected of a child of such age, it holds, was properly left with the jury to determine, as well as whether, upon all the facts, he was thereby guilty of contributory negligence. In this connection it should also perhaps be noted that attention is called to the fact that this boy had previously seen small boys frequently riding on the car in the same manner as he did, although his father had forbidden him to do so, and threatened him with punishment in such case.



Assuming, therefore, that this child was in a place of danger, that the motorman and acting conductor knew it, that the child was of tender years, though of sufficient age to exercise some degree of care, and that the measure of it depended upon his capacity and intelligence, yet, the court says, in summing up the case, the motorman controlling the movement of the car was bound to use reasonable care to avert the danger; and whether he did so, under the circumstances, was a question properly left to the jury, as stated above.

The boy having been quite seriously injured, and not fully recovered at the time of the trial, whether he would ever completely recover from such injury being a matter of considerable uncertainty, the supreme court holds that an award of \$750 damages was not excessive.

Mr. Justice Mitchell concurs in the conclusion, although he says that he considers the case a close one, while Mr. Justice Cady accompanies his reluctant concurrence with the remark that in these days, when, as a general rule, parents exercise so little control over their children, and the conductor is not allowed to exercise any efficient control over them at all, and the children have no wholesome fear of anything, and no respect for constituted authority, it is exceedingly difficult for the conductors of street cars and the drivers of other vehicles to keep children from riding on all sorts of dangerous places upon and beneath the vehicles.

#### Duty of Keeping Prescribed Portion of Street in Repair Includes That of Repaving with Asphalt.

*Conway v. City of Rochester (N. Y.), 51 N. E. Rep., 395. Oct. 18, 1898.*

The common council of the city of Rochester determined to pave, with asphalt, one of its streets that was in part occupied by the tracks of the Rochester Railway Company, over which its cars were operated. The officers of the company decided that it could not be compelled to contribute towards the expenses of repaving the streets, and the municipal authorities seemed to reach the same conclusion. But when the latter proceeded to take the necessary steps to pave the street from curb to curb, without giving the company notice that it was required to pave the portion of the street within its tracks and two feet in width outside of its tracks, a taxpayer in the city, who was also an abutting owner upon the street, instituted this suit to restrain the defendants from awarding the paving contract. He obtained a temporary injunction; but this was soon vacated, and the appellate division of the supreme court affirmed the order vacating it, though it decided to allow an appeal to the court of appeals, certifying two questions for the latter's consideration.

The first question was as to whether the abutting owners on the street referred to were liable for the cost of constructing a new pavement between the tracks, and the rails of the tracks, and for two feet in width outside of the tracks, of the railway company. The second, as to whether the duty of the common council of the city to request the railway company to construct a pavement between its tracks, and the rails of its tracks, and for two feet outside thereof, on said street, before the city constructed such pavement, was mandatory. The court of appeals of New York answers the first question in the negative, and the second in the affirmative, and reverses the order of the appellate division, with costs.

This decision is based upon the construction which the court gives section 98 of the general railroad law of the state of New York, which provides: "Every street surface railroad corporation so long as it shall continue to use any of its tracks in any street, avenue or public place in any city or village shall have and keep in permanent repair that portion of such street, avenue or public place between its tracks, the rails of its tracks, and two feet in width outside of its tracks under the supervision of the proper local authorities, and whenever required by them to do so, and in such manner as they may prescribe. In case of the neglect of any corporation to make pavements or repairs after the expiration of thirty days' notice to do so, the local authorities may make the same at the expense of such corporation," etc.

First of all, the court notes that the legislature by this statute intended to provide that so much of a street as it specifies shall

be kept in repair, the duty of doing it being not suggested or advised, but commanded.

Then it observes that the party charged with the performance of the duty is specifically pointed out, and says that the language of the statute requiring that the street surface railroad corporation continuing to use any of its tracks in the street "shall

keep in permanent repair" such portion thereof is mandatory, and that the municipal authorities are given no authority to relieve the railroad corporation of the whole or any portion of the needed repairs, or to impose the whole or any portion of the cost upon the abutting owners or the city at large.

The court further says that the local authorities may determine when and how the street shall be repaired, and that when that is done the statute steps in, and says the railroad company is to do the work, the language employed being mandatory so far as the railroad corporation is concerned.

It also holds that this statute gives the local authorities the right to decide that the entire street shall be repaved, and that the material used shall be asphalt, and that when this determination is made, the statute intervenes and commands that the company shall make the repairs thus ordered, under the supervision of the local authorities.

#### Insists That the Day of Grade Crossings is Past.

*Chester Traction Company v. Philadelphia, Wilmington & Baltimore Railroad Company (Pa.), 41 Atl. Rep., 449. Oct. 17, 1898.*

This was a suit brought by the traction company to restrain the railroad company from interfering with the former in crossing the latter's track. In the court of common pleas the traction company prevailed, but the supreme court of Pennsylvania now reverses the judgment it obtained there.

While the supreme court opinion was being written, it is incidentally remarked, perhaps for some moral effect, news of the Cohoes accident was received, where every passenger in the electric car went into one or the other of the two classes, of 16 killed and 17 injured, and the servants of each system attributed the accident to the negligence of those of the other.

Taking up the second section of the act of June 19, 1871: "If in the judgment of such court it is reasonably practicable to avoid a grade crossing, they shall by their process prevent a crossing at grade." the supreme court holds that the meaning of this, as it has said before, is that the day of grade crossings is past, and they ought not to be permitted, except in case of imperious necessity.

It further holds that what is reasonably practicable is not to be determined by the financial ability of the road seeking to cross, but by the physical practicability of avoiding the grade crossing. Here the traction company showed by competent witnesses that the expense, approximately, of avoiding the grade crossing in question by one overhead, would be from \$150,000 to \$200,000, while the entire capital stock of the corporation was but \$500,000. But the supreme court answers that the financial inability of the company was not a test to determine whether an improvement to carry safely 3,000,000 passengers was reasonably practicable; otherwise, the poorer the company, the more unlimited its right to interfere with the exercise by the older company of its franchise, and the more freely could it disregard the safety of the traveling public. A corporation which undertakes to carry safely 3,000,000 passengers should provide a capital sufficient to build a superstructure which will not subject this multitude to avoidable risk at crossing.

But this traction company had already two grade crossings, on other streets, which crossings, on account of a great increase of travel owing to an increase of the city's population and business, were not of sufficient capacity to enable it to quickly move its cars. However, the supreme court holds that did not constitute "imperious necessity." It says that grade crossings are not to be established to promote the mere convenience of the railroad seeking to cross. The older company still has some rights under its charter, and the presumption always is that, as between senior and junior rights, the legislature did not intend the latter should interfere with the older. Consequently, the legislature, by giving



the right to cross at grade, could not have intended to seriously disturb or destroy the older franchise.

Nor does the fact that heavy damages may be exacted by the passenger as a penalty for neglect to carry safely have much weight, in the court's opinion, in the determination of the question. Admit that a collision would cost one or the other company, or both, a heavy sum. That would mean a loss of dividends to the company, and a loss of life or limbs to the traveling public. The risks are not equal, and humanity shrinks from offsetting the one against the other.

Besides, the court says, by unnecessarily crossing at grade, the older corporation has imposed upon it a heavier burden than that which, in strictness, was incident to its grant. In addition to its obligation to carry safely on its own contract, it must be watchful that it does not injure those of the public carried by another corporation across its roadbed. It cannot be maintained that such results as have been mentioned would not seriously impair the value of the older franchise.

In conclusion, the supreme court says that it has more than once called attention to the necessity of further legislation, because, while every one admits that existing grade crossings ought to be abolished, and no further ones, except in the rarest cases, permitted, the existing legislation does not provide means equitably adequate to the end. Nothing has been added to the provisions of the act of 1871, which, as a solution of the difficulty, is, in effect, a mandate to the courts to prohibit grade crossings, unless over or under ones are physically impracticable, and unless crossings be an imperious necessity. The courts have no power to determine exactly how they shall be avoided, or to equitably apportion the expense among those interested, as under the New York statute lately adopted. They must administer the law as they find it, and not as they think it ought to be.

#### Duty Owed to Persons Picked Up on Fenders.

*Weitzman v. Nassau Electric Railroad Company (N. Y.), 53 N. Y. Supp., 905. Oct. 11, 1898.*

This was an action brought to recover damages for the death of a child about five years of age that was picked up on a fender and carried a distance of from 32 to 150 feet, when he rolled off from the fender in front of the still advancing car, and was run over and killed, the car stopping within its own length after the child had fallen.

The trial court charged the jury that the accident, if it happened, and the damage, if it was occasioned, and the actionable injury, if there was one, came at the time the railroad car struck his person, and no matter what happened afterwards, while that might have increased the injury, it had not increased the liability of the company. Continuing, it said that the whole charge was negligence, and that if the defendant was negligent, and the plaintiff, or the child, was free from negligence, at the time the actual collision occurred, the jury were not to render a verdict because of another negligence which they might find the motorman committed after the actual collision. The right of action was made out then, if it was made out at all, and there could be no case of the picking up of the child upon the fender giving a right of action or a right of action arising by reason of something that occurred afterwards; that would be entirely illegal, and the jury must dismiss it from their minds.

But the second appellate division of the supreme court of New York holds that the trial court was in error. It says that the law does not contemplate that a street railroad corporation shall become a modern juggernaut, with its sacrificial car traversing with relentless energy the streets and avenues of our populous cities, running down the aged, the feeble, and the helpless, who may chance to cross its path, or that, having gathered them into its net, it shall carry them along and offer them as a sacrifice to the cruel wheels, at the pleasure of the motorman.

Conceding that the child killed was *sui juris*, that is, in his own right, or under no legal disability, and that he was, as a matter of law, guilty of contributory negligence in stepping upon the track of the defendant at the same moment that the car arrived at the point of contact, the appellate division repeats that the evidence showed that he was not killed by the original impact, but as above stated. To say that the defendant owed this child no

duty; that it was responsible for no degree of negligence on the part of its servants after it had struck the child and failed to kill him,—declares the court, is to utterly mistake the policy and the rules of law. Whatever may have been the duties or obligations of the parties, up to the moment that the child was picked up on the fender, there can be no question, it insists, as to the obligation of the defendant after that feat had been accomplished; and a failure to discharge that obligation was negligence to which the child, under the circumstances, could not contribute.

It was the duty of the defendant, continues the court, to equip its cars in such a manner as to reduce to a minimum the chances of a accident. The duty to equip the cars with fenders carries with it the duty to so operate them as to accomplish the end for which they were designed, and a human being having been gathered into one of these fenders, no matter by what degree of negligence on his part, imposes upon the defendant the immediate duty of so operating the car as to afford him an opportunity to be taken from his dangerous position. Whatever the degree of negligence on the part of the individual in the original contract, that negligence culminated in the accident which landed him in the net of the fender. From that moment a new relation existed between the parties, and any act or omission on the part of the defendant amounting to a lack of the care demanded by the situation, and resulting in the death of the plaintiff's intestate, is sufficient to charge the company with negligence.

It is not to be understood that the defendant becomes an insurer of every person who is caught in its fender, but simply that it is bound to use that same degree of care which a reasonably careful and prudent man would, or ought to, use under the same circumstances, and this is always a question for the jury to pass upon.

When the child in question reached a place upon the fender of the defendant's car, the defendant had notice that the child was in a dangerous position; and if the defendant had time, and with the exercise of reasonable care could have prevented the injury or death of the child, it was the defendant's duty to do so, and a failure on its part was a negligence which entitled the plaintiff to recover damages, and the question of whether the defendant did or did not discharge this duty should have been submitted to the jury. The rule of law is that, "notwithstanding negligence upon the part of the person injured, he may recover if the railway company, after such negligence occurred, could, by the exercise of ordinary care, have discovered it in time to have avoided inflicting the injury."

The appellate division also states that the ruling of the trial court, in refusing to allow the plaintiff to show by an expert motorman that the car, if equipped with the appliances commonly in use, could have been stopped within a space of 20 feet, is not in harmony with the authorities in New York state. It maintains that the railroad company owing the duty to the plaintiff's intestate, and to the public, to have its cars equipped with the best appliances, it was competent for the plaintiff's witnesses to testify as to the distance within which a car properly equipped might have been stopped.

Here the offer was to prove that the car might have been stopped by the defendant in time to have avoided the collision. It was shown that the witness was an expert motorman, with a large experience; that he was familiar with the leading systems generally in use in the equipment of electric railroads; and that he was an electrician; and the appellate division says that it seems to it that the mere fact that he had not made an examination of the particular apparatus in use by the defendant did not disqualify him from testifying as to the distance within which a car properly equipped might have been stopped.

If the car of the defendant, properly equipped, could have been stopped in time to have prevented the accident, after the motorman saw the child approaching the track, the jury, the court holds, were authorized to find that it was negligence on the part of the defendant to have permitted the collision, notwithstanding the negligence of the child in getting into a position of danger.

Finally, the court holds that it was for the jury to determine whether the conduct of the child's mature sister in permitting him to cross the street, in her sight, to purchase candy, was in the exercise of reasonable care, assuming the child to be non *sui juris*, or not acting in his own right; and that it was not negligence as a matter of law.

## THE STRIKE THAT FAILED.

After considerable correspondence W. E. Storrs, president of the union of the employes of the Syracuse (N. Y.) Rapid Transit Company, ordered a strike, November 18, to enforce the following demands: 1. The reinstatement of men discharged since the strike last August. 2. Recognition of the union, that is, that the company confer only with the officers of the union. 3. That the company employ no men not members of the union. 4. That in event of the discharge of an employe the question be referred to a committee of citizens.

The company refused to grant any of these demands, and in replying to an "ultimatum" of Mr. Storrs, C. L. Allen, acting general manager of the company, quoted the following paragraphs from the letter of the state board of arbitration written to the officers and employes of the company on September 24, last:

"To the employes it is suggested: That they make no issue with the company on the retention or employment of men not members of the labor union; that they interpose no opposition to dismissal from the company's service of men who have been given a hearing by the company and furnished reasons for discontinuance of employment."

"The right of employes to refuse work either single or in combination, except upon terms and conditions satisfactory to themselves, is balanced by the right of employers to refuse to engage the services of any one for any reason that they deem proper."

The strike was ordered for November 18, but only 18 men quit work; there are 270 in the local union. Mr. Mahon, president of the Amalgamated Association of Street Railway Employes, arrived two days later, but his presence did not infuse any vitality into the strike.

On November 21, a meeting of the employes was called, at which Acting General Manager Allen presided. He gave the men some information as to the mutual benefit associations established in various cities, and a committee was appointed to investigate the matter. It is to be hoped such an association can be organized in Syracuse, as it would undoubtedly do much to bring the men and the management closer together.

## RAILWAY ELECTRICIAN KILLED BY ELECTRIC LIGHT WIRE.

Clement Wise, one of the night inspectors of the Toledo Traction Company, died from a shock received from an arc lamp circuit. At 3:40 a. m. on November 2, in company with the trolley trouble man, he was taking care of the wires while a house was moved across the tracks at Williams and St. Clair streets. It was necessary to move an arc lamp at this point and it was lowered. Wise and the trolley man took hold of the wooden cross arm just above the lamp and started with it to the pole to hang it there temporarily until the house had passed.

As the two men were about to step on the curb the line man cautioned Wise to be careful of the catch basin cover. In some way Wise came in contact with either the wire or the frame of the lamp, but as the wire was covered with good rubber insulation it seems that his wrist must have come in contact with the chimney of the lamp. He fell instantly, but rose again and took two or three steps and then sank to the ground unconscious. The men tried to revive him according to printed instructions posted at headquarters and succeeded in starting his breathing. In removing him to a place of shelter he died on the way.

The circuit of which this lamp was a part was connected to a 125-arc machine and carried about 110 lamps at a voltage between 4,000 and 5,000. This accident occurred a short time before the street lamps were extinguished, after which the circuit was tested with a 50,000-ohm magneto set and proved clear of grounds. In reporting this unfortunate accident some of the newspapers did not clearly distinguish between the trolley wire and the light wire as the cause of his death. It will be noted that the voltage of the electric light circuit was nearly ten times as great as that of the trolley wire and proportionally far more dangerous, and still death did not result instantly.

## ELECTROLYSIS AT SPOKANE.

One of our correspondents advises us that the suit of the Spokane (Wash.) Gas Company against the Washington Water Power Company, which owns the Spokane Street Railway, for \$100,000 damages for alleged electrolysis of the gas mains, came to trial the latter part of October before Judge Richardson in the superior court.

The Gas Company had as exhibits a number of pipes showing the effect of electrolysis. Among the expert witnesses in the case were Professor E. Darrow, of the Washington Agricultural College and School of Science, and Bert L. Baldwin, consulting engineer, of Cincinnati.

Prof. Darrow and Mr. Baldwin made an examination of the conditions existing between the pipes and rails, and found them very bad. In many places a difference of potential of 50 volts was found, the pipe being positive; in other places this condition was reversed, and there was also an extended area of neutral territory, where there was practically no difference of potential between the rails and pipes. As much as 75 amperes was found flowing in a single pipe line.

The case was stubbornly contested and we have not yet been advised of the outcome.

Spokane has a population of about 50,000, and in the lighting field the Spokane Gas Company and the Washington Water Power Company are competitors; both are doing a large business. The Gas Company pays \$4.50 per ton for its gas coal, while the Power Company has a water power of 100,000 h. p. at low water.

## ADVERTISING BY STREET RAILWAYS.

C. D. Wyman, general manager of the New Orleans & Lake Railroad, of New Orleans, is a firm believer in advertising, and keeping the public fully informed as to what the company has to offer it. Newspapers, the cars, bulletin boards, etc., are all used,

## WE OWN AND OPERATE

REACHING ALL

Parks, R. R. Depots,  
Points of Interest,  
Places of Amusement, etc.

16 LINES OF  
ELECTRIC CARS  
IN THE CITY OF NEW ORLEANS.

TROLLEY PARTIES ARE OUR SPECIALTY

HAVE YOU BEEN TO THE OTHER ISLAND OF THE SOUTH? **WEST END!** OPEN SUMMER AND WINTER

FREE GUIDE TO THE CITY ISSUED BY US IS THE MOST COMPLETE PUBLISHED

GENERAL OFFICES: Cor. Magazine and Pleasant.  
STARTER'S OFFICE: Canal and Bourbon

**N. O. CITY & LAKE R. R. Co.**

and recently the plan of printing a notice on the reverse side of the company's envelopes has been adopted. One of these notices, which is printed in yellow ink on the envelope, is shown herewith, reduced.

## WORK COMMENCED ON BOSTON ELEVATED STRUCTURE.

The work of erecting the first section of the elevated structure of the Boston Elevated Railway has been commenced. This section is from City square in Charlestown to Causeway street in Boston proper, and is required by the statute to be completed by January 1, 1899.

Work on the second section, from the junction at City square in the direction of Sullivan square, Charlestown, will be soon commenced, and it is stated that the entire seven miles of the elevated road will be completed by two years from next spring, which is well within statutory limit.

The details of the equipment have not yet been decided upon, further than that the cars will be about 50 ft. in length and seat 50 passengers.



## NEW CARS FOR CHICAGO CITY.

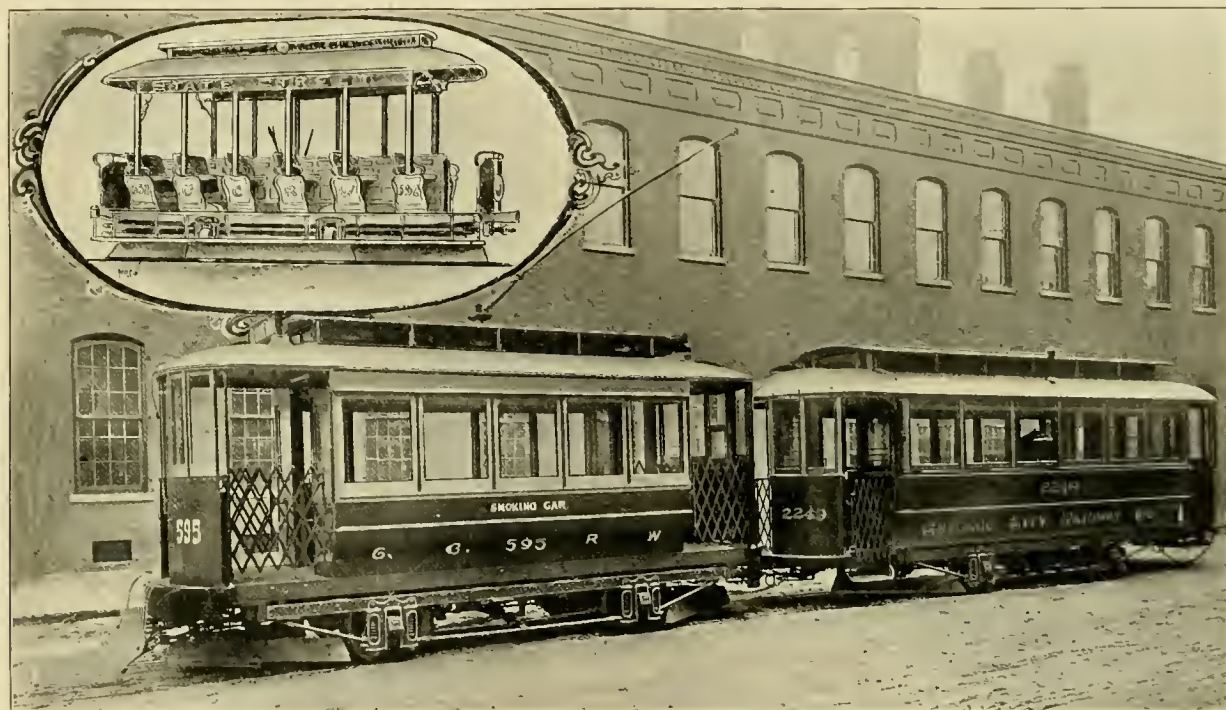
The heavy morning and evening traffic on the lines of the Chicago City Railway Company is largely made up of business men going to and from the center of the city. A very large per cent of this class is addicted to the habit of smoking. On the elevated lines each train, whether composed of five, four or three cars, has one car reserved for smoking, and it is always well patronized. On the surface lines the only places for smokers on closed cars are on the front platforms, and these are generally crowded, interfering with the movement of the other passengers. Men constantly expose themselves in this manner in order to enjoy their morning smoke.

Superintendent Nagle observed this deficiency in the winter equipment and has had constructed two new cars, as shown in the illustration. The motor car is an old grip car remodeled, with seats rearranged, vestibuled at both ends, lever brakes

this uniformity of color affecting a considerable saving in the cost of painting. The car is heated by the "New Columbia" self-feeding car stove, made by the McGuire Manufacturing Company.

Both the cars are mounted on wooden trucks, designed by C. E. Moore, master mechanic. These trucks have been tested by two years of service and have proved very satisfactory in easy riding qualities, low cost of construction and maintenance.

In the illustration a Providence fender, made by the Consolidated Car Fender Company, of Providence, is shown on the motor car. The cradle of the fender is hinged on trunnions at the front of the platform so that it can be turned up against the dash or let down at any desired angle, this being regulated by a steel bar projecting under the platform and held by a trigger which, when the motorman presses it with his foot, lets the cradle drop to the track. The cradle is made up of curved steel bands, held together at the bottom by a rod which is en-



NEW CHICAGO CITY TRAIN.

applied and mounted on a new truck. This is the smoking car, and its chief peculiarity is that it has no steps, ingress and egress being through an opening in the rear vestibule to the trailer. If short hauls were the rule this arrangement would be inconvenient, but during the rush hours in the morning the passengers ride several miles from the residence districts and leave the cars only at a few crossings in the business center; in the evening it is the reverse. By this arrangement one conductor can have charge of both cars. In the motor the ventilators have been arranged as on the elevated cars. Each little window is hung on a pivot and all along one side are controlled by a sliding rod. In this way the smoke in the upper part of the car can be drawn out without causing a draught in the car itself. Electric heaters are placed under the seats.

The trail car, which has been recently constructed, is now the standard for the new cars of the company and the prototype for the 100 cars which have been ordered from the John Stephenson Company. The car body is of the most substantial construction. The windows are large and fixed in padded sashes, effectually preventing all rattling and making a close, warm car. The interior finish is of cherry with a white birch ceiling, giving a rich appearance. The car is lighted either by incandescent lamps or Pintsch gas, this arrangement being made so that the car may be used either on the electric or cable lines. The exterior of the car is painted in different shades of green,

cased in small rubber cylinders. The upper part of the fender, covering the bumper, is hinged to the lower portion and the two parts can easily be moved together from one end of the car to the other, or from one car to another.

The initial trip of this train was made November 17, with the mayor and party of public officials and a REVIEW representative as guests of the company. The Clark street line has been closed for some months while the work of building a viaduct and elevating the railroad and street railway tracks at 16th street was in progress, and this party was the first to pass over the completed viaduct. President Bowen intends to put this train in service on the Indiana avenue line and see with what favor it is received by the patrons and what defects, if any, can be developed by service. If it proves successful, as is expected, it will be forerunner of many similar trains.

A hold-up of an electric car is reported from St. Louis, \$10, two revolvers and some jewelry were obtained from the conductor and motorman.

The Citizens' road, of Detroit, has adopted a new style of ticket in order to make counterfeiting more difficult. The tickets are lettered and numbered in series, and the series may be changed at any time.

THE BURSTING OF SMALL CAST-IRON FLY-WHEELS.

Abstract of paper read by Chas. H. Benjamin, of Cleveland, O., before the American Society of Mechanical Engineers.

Of late years the failures of large fly-wheels have become alarmingly common. Every month brings its record of one or more disasters of this sort, some of them entailing loss of life and serious destruction of property. It is not the purpose of this paper to discuss the causes of such accidents, further than to notice the fact that the high belt speeds and close regulation required in electric plants have been indirectly responsible. Many of the fly-wheels have failed on account of excessive speed due to disarrangement of the governor and consequent racing of the engine. In some instances it has been difficult to determine the cause on account of the destruction and excitement at the moment. In no small number of instances, however, the wheels have burst at speeds but slightly above the normal and when the factor of safety was apparently ample.

Mr. James Stanwood, of this Society, was the first to point out the conditions of stress existing in a fly-wheel rim and to show that the bending due to centrifugal force might reduce very materially the bursting speed. (Transactions A. S. M. E., vol. XVI, p. 251.) This subject was further developed by Professor Lanza, and the probable amount of stress due to bending was indicated as well as its effects upon rim joints. (Transactions A. S. M. E., vol. XVI, p. 208.) It occurred to the writer that a series of experiments on small cast-iron wheels might throw some light on the causes of failure and lead to more rational formulas for design.

The quality of the metal in a small wheel is better than in a large, and the stresses due to uneven cooling are much less. The linear speed of rim at which a large wheel will burst will therefore be less than that obtained by experiments on small wheels.

The experiments about to be described were conducted under the immediate direction of the writer at the laboratories of Case School of Applied Science, and he was present at the bursting of nearly every wheel. Acknowledgment should be made of the services of the students who carried out the experiments, Messrs. Bishop and French of the class of '97 and the Messrs. Emrich, of the class of '98. Without their intelligent and faithful assistance the work could not have been done.

The wheels were all cast-iron and were clean, perfect castings. Two diameters were used, 15 in. and 24 in., and each wheel was a scale model of some actual fly-wheel designed by a reputable firm. The wheels numbered 1 to 10 had solid rims with the exception of No. 5. Wheel No. 11 was a special wheel, as will be explained later. The wheels numbered 12 to 17 had each two joints in the rim and were 24 in. in diameter. All the wheels numbered 1 to 10 were reduced models of a solid-rim fly-wheel 10 ft. in diameter now in use on a 12x30 Allis-Corliss engine in the laboratory. The wheels numbered 12 to 15 were models of the same wheel on a larger scale, with rim joints designed by the writer. The two wheels numbered 16 and 17 were models of the fly-wheel of a Corliss blowing engine. Reference to the various illustrations will show the general appearance of the various wheels tested before and after breaking. Tables I and III give the dimensions of the wheels in detail.

To give to the wheels the speed necessary for destruction, use was made of a Dow steam turbine capable of being run at any speed up to 10,000 r. p. m. The turbine shaft was connected to the shaft carrying the fly-wheel by a brass sleeve coupling, loosely pinned to the shafts at each end in such a way as to form a universal joint, and so proportioned as to break or slip without injuring the turbine in case of sudden stoppage of the fly-wheel shaft.

One experiment with a shield made of 2-in. plank convinced us that safety did not lie in that direction, and in succeeding experiments with the 15-in. wheels a bomb-proof constructed of 6x12-in. white oak was used. The first experiment with a 24-in. wheel showed even this to be a flimsy contrivance. In all subsequent experiments a shield made of 12x12-in. oak was used.

TABLE I.—FIFTEEN-INCH WHEELS.

No.	Style.	Rim.				Arms.		Weight of Wheel, Pounds.
		Diameter, Inches.	Brdth, Inches.	Depth, Inches.	Area, Sq. Inches.	No.	Area, Sq. Ins.	
1	Solid	15 1/4	2	.70	1.4	6	.46	20.87
2	"	15 1/4	2	.65	1.3	6	.46	20.41
3	"	15	2	.615	1.23	6	.46	19.12
4	"	14 3/8	2	.52	1.04	6	.46	16.62
5	Sectional	15 3/2	. . . .	. . . .	. . . .	6	.46	20.87
6	Solid	15 3/2	2	.69	1.38	3	.46	19.25
7	"	15	2	.615	1.23	3	.46	16.56
8	"	14 1/2	2	.475	.95	3	.46	13.68
9	"	14 1/2	1 1/2	.400	.75	6	.46	12.68
10	"	14 1/2	1 1/4	.347	.65	6	.46	13.00

TABLE II—FIFTEEN-INCH WHEELS.

No.	BURSTING SPEED.		Centrifugal Tension = $\frac{v^2}{10}$ .	Remarks.
	Revs. per Minute.	Feet per Sec. = $v$ .		
1	6,525	430	18,500	
2	6,525	430	18,500	
3	6,035	395	15,600	Thin rim.
4	5,872	380	14,400	Thin rim.
5	2,925	192	3,700	Joint.
6	5,600*	368	13,600	Three arms.
7	6,198	406	16,500	Three arms.
8	5,709	368	13,600	Three arms.
9	5,709	365	13,300	Thin rim.
10	5,709	361	13,000	Thin rim.

\*Doubtful.

TABLE III. TWENTY-FOUR-INCH WHEELS.

No.	SHAPE AND SIZE OF RIM.				Style of Joint.	Weight of Wheel, Pounds.
	Diameter, Inches.	Breadth, Inches.	Depth, Inches.	Area, Sq. Inches.		
11	24	2 1/2	1.5	3.18	Solid rim.	75.25
12	24	4 1/8	.75	3.85	Internal flanges, bolted.	93.
13	24	4	.75	3.85	" " " "	91.75
14	24	4	.75	3.85	" " " "	95.
15	24	4 1/8	.75	3.85	" " " "	94.75
16	24	1.2	2.1	2.45	Three lugs and links.	65.1
17	24	1.2	2.1	2.45	Two " " " "	65.

TABLE IV. FLANGES AND BOLTS.

No.	FLANGES.			BOLTS.		
	Thickness, Inches.	Effective Breadth, Inches.	Effective Area, Inches.	No. to Each Joint.	Diameter, Inches.	Total Tensile Strength, Pounds.
12	1 1/8	2.8	1.92	4	5/8	16,000
13	1 1/8	2.75	1.89	4	5/8	16,000
14	1 1/8	2.75	2.58	4	5/8	16,000
15	1 3/8	2.5	2.34	4	5/8	20,000

By Testing Machine.

Tensile strength of cast-iron = 19,000 pounds per square inch.  
 Transverse strength of cast-iron = 45,000 pounds per square inch.  
 Tensile strength of 5/8 bolts = 4,000 pounds.  
 Tensile strength of 3/4 bolts = 5,000 pounds.

TABLE V. FAILURE OF FLANGED JOINTS.

No.	Area of Rim, Sq. Ins.	Effect. Area Flanges, Sq. Ins.	Total Strength Bolts, Lbs.	BURSTING SPEED.		CENT. TENSION.		Remarks.
				Rev. per Min.	Ft per Sec. = $v$ .	Per Sq. In = $\frac{v^2}{10}$ .	Total Lbs.	
11	3.18	. . . .	. . . .	3,672	385	14,800	47,000	Solid rim.
12	3.85	1.92	16,000	. . . .	. . . .	. . . .	. . . .	Flange broke.
13	3.85	1.89	16,000	1,760	184	3,400	13,100	Flange broke.
14	3.85	2.58	16,000	1,875	196	3,850	14,800	Bolts broke.
15	3.85	2.34	20,000	1,810	190	3,610	13,900	Flange broke.



Even this shield was split repeatedly and had to be reinforced by bolts. The brick piers of the basement furnished havens of refuge for the experimenters and no accidents occurred, but sundry holes in the brick wall, broken hangers, and riddled belting remain as souvenirs of the spiteful force of the flying fragments. The wheels were usually demolished by the explosion, as may be seen from the cuts. No crashing or rending noise was heard, only one quick, sharp report, like a musket shot.

The determination of the speed offered some difficulties at first, it being too great for the successful use of a counter or tachometer. A commutator of one break was arranged on the fly-wheel shaft and this connected through the battery circuit with an ear-phone in an adjoining room. This arrangement worked satisfactorily, giving a clear, musical tone, and the number of

electrical tape. Careful observations convinced the writer that there was no appreciable slip.

The tachometer used was of the usual rotary pendulum type and was calibrated several times by comparison with a speed counter.

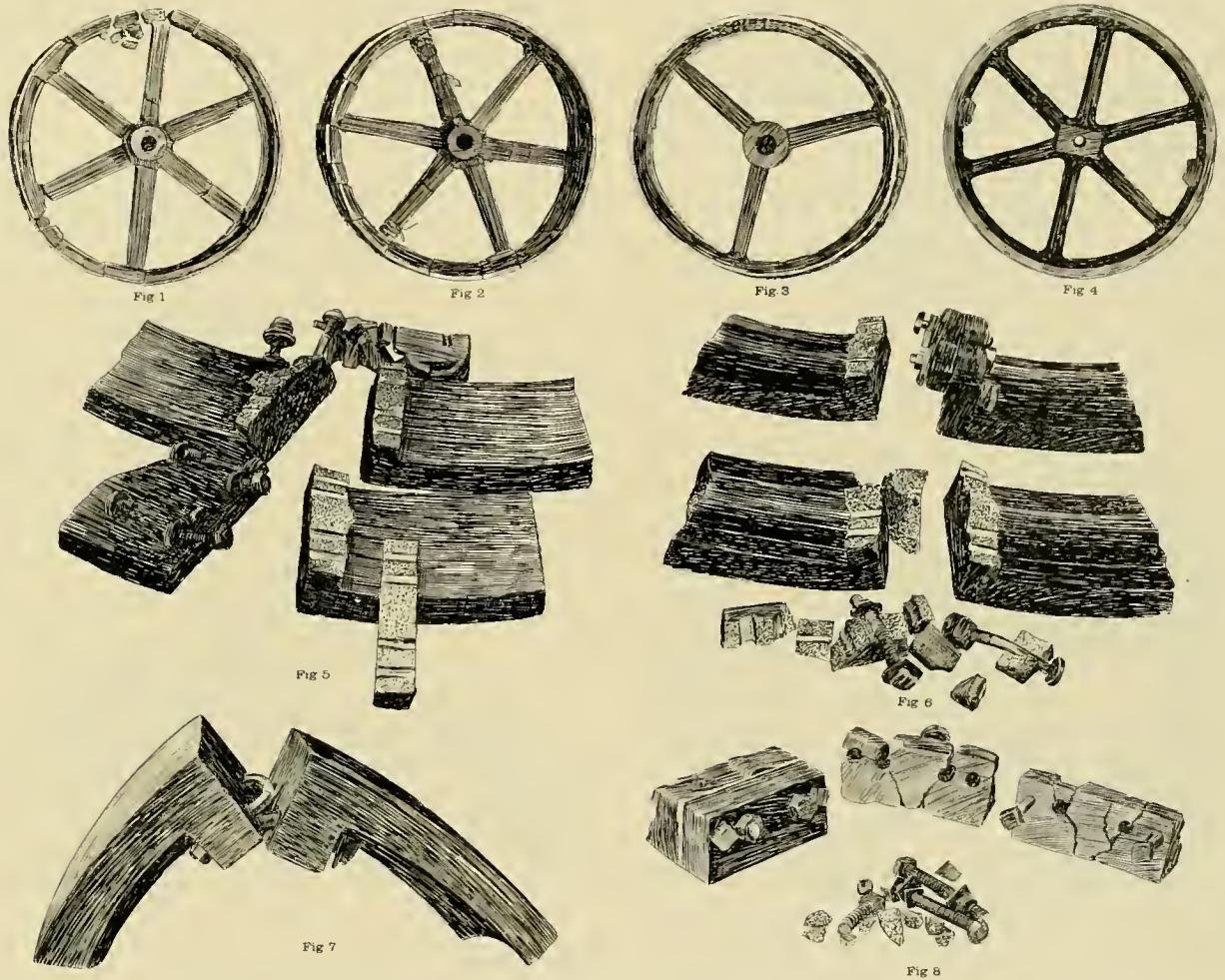
### FIFTEEN-INCH WHEELS.

Test pieces cast from the same ladle as these wheels were broken in the testing machine, and the following average values obtained for the breaking strength:

Tension, 19,000 lbs. per sq. in.

Cross-breaking, 39,000 lbs. per sq. in.

These wheels were all turned on the face and edges of the rim, and were carefully balanced by winding copper wire around the arms near the rim.



CAST-IRON FLY-WHEELS AFTER BURSTING.

vibrations corresponded closely to the speed as measured by a reducing counter shaft and speed counter. It was soon discovered that the audible tone produced by the machine itself when running at a high speed corresponded exactly to the tone in the ear-phone, and consequently the ear-phone was discarded. Two observers, having trained musical ears and provided with tuning forks, had no difficulty in determining the pitch within half a tone, the quarter tones being estimated. The error due to this method did not exceed 5 per cent, and was probably less than if an attempt had been made to get the speed with a tachometer. The bursting speed of the wheels having rim joints was too low to produce a musical tone with any distinctness, and it became necessary to resort to the tachometer. It was not deemed safe for the observers to apply the instrument directly to the fly-wheel shaft, and a counter shaft reducing the speed from two to three times was employed. Wooden pulleys were used, connected by a band consisting of several thicknesses of

Wheels Nos. 1 and 2 were practically identical in size and shape, as may be seen by Table I, and broke at the same speed, viz., 6,525 r. p. m., or a rim speed of 430 ft. per second.

Fig. 1 shows the appearance of No. 2 after rupture.

Nos. 3 and 4 were similar to the preceding, save that the rims were turned down thinner. No. 3 burst at a speed of 6,035 r. p. m., or a rim speed of 395 ft. per second, and No. 4 at 5,872 r. p. m., or 380 ft. per second. The rims, being thinner, bent more between the arms, so that the rims failed at a less speed. Fig. 2 shows the appearance of No. 3 after rupture. The shape of fracture at the outer ends of the arms in all the wheels usually indicated that the rim broke first midway between the arms, and that then the two parts of the rim flew outward and broke off at the arm.

Wheel No. 5 had two joints in the rim at opposite extremities of a diameter. The strength of the joint was designed to be one-third the tensile strength of the solid rim, but the wheel



burst at only 2,925 r. p. m. with a centrifugal tension of less than one-fourth that of the solid wheels.

Nos. 6, 7 and 8 had only three arms, every other arm having been removed from the pattern before casting. The object of this was to show more clearly the bending of rim due to centrifugal force. These three wheels burst at speeds of 5,600, 6,200, and 5,709 r. p. m. respectively. The figures for No. 6 were obtained with a tachometer and are doubtful, being probably too low. Wheel No. 6 is shown in Fig. 3.

Wheels Nos. 9 and 10 were of the original six-armed type, but with rims turned down to exceeding thinness, as shown in Table I. They each burst at a speed of 5,709 r. p. m., or at rim speeds of 365 and 361 ft. per second respectively, a reduction of over 16 per cent from Nos. 1 and 2.

These results are summarized in Table II. An examination of the column containing the values of  $v$  in feet per second will show that as the segments of the rim between the arms become weaker as beams, either through increase of length or decrease of thickness, there is a falling off in the bursting speed.

To determine to what extent the strength is affected by bending, values of  $v^2 \div 10$  have been calculated. As has been shown by Mr. Stanwood in the paper before referred to, this expression represents approximately the tensile stress on the square inch of section of rim due to the centrifugal force, for cast-iron. By comparing these values with the tensile strength of the iron before noted, viz., 19,000 lbs. per sq. in., the amount of stress due to bending may be estimated. This difference varies from 500 lbs. per sq. in. in Nos. 1 and 2 to nearly 6,000 lbs. per sq. in. in Nos. 9 and 10—being greatest in the wheels with thin rims or few arms. None of these wheels, however, except No. 5, would have been unsafe at the usual limit for fly-wheel rims of 100 ft. per second. Wheel No. 10 would have had a factor of safety of over 12 at that speed.

#### TWENTY-FOUR INCH WHEELS.

All the wheels numbered from 11 to 17 were of the above diameter. No. 11 was a special wheel which had been in actual use. This wheel burst at 3,670 r. p. m., or a peripheral speed of 385 ft. per second, which corresponds well with the average speed of the 15-in. wheels. The explosion was very violent, and completely wrecked the shield. The quality of the iron was unknown, save that it appeared clean and close-grained.

#### FLANGED JOINTS.

The wheels numbered 12 to 15 were of the same model as the 15-in. wheels on a larger scale, but each wheel had two internal flange joints in the rim, midway between the arms, as shown in Fig. 4. The joints were all carefully planed and the holes drilled to match. The wheels were not turned on the face, but were balanced the same as the others. In none of the experiments was there any shaking or tremor, only a dull roar of increasing intensity, then a single sharp report and quiet, except for the hum of the relieved turbine.

The proportions of the flanges and bolts are given in Table IV. The bolts used were of steel, and samples of each broken in the testing machine gave the results shown in the table.

Wheel No. 12 burst at a speed of less than 1,800 r. p. m., but the exact speed was not recorded. The flanges broke, as shown in Fig. 5, but the bolts were uninjured, except for a slight stretching.

No. 13 was a duplicate of No. 12 in every way, and burst at 1,760 r. p. m., or 184 ft. per second. Fig. 6 shows the joints after rupture; the bolts uninjured but the flanges broken through the bolt holes. The flanges of the pattern were then strengthened by adding  $\frac{1}{4}$  in. to the thickness, the bolts remaining the same.

Wheel No. 14 burst at 1,875 r. p. m. with a rim speed of 196 ft. per second, in this case the bolts failing, as shown in Fig. 7. This cut is interesting, as showing clearly the bending action of the centrifugal force on the bolts, using the inner edge of the flange as a fulcrum. This joint failed first; the wheel then opened like an oyster, fracturing the rim on each side of the joint opposite, the latter joint being left intact.

In No. 15 bolts  $\frac{3}{8}$  in. in diameter were used, and the wheel failed at 1,810 r. p. m., or a rim speed of 190 ft. per second. In this experiment the flanges of one joint were badly broken, as may be seen from Fig. 8, the bolts remaining whole. The sec-

ond joint was uninjured, as in No. 14. The broken bolt seen in the cut came from the hub and should not appear. A close inspection of the two bolts in foreground of the cut shows them to be nearly sheared off at the joint, a phenomenon which is interesting but which the writer is unable to explain. It would indicate that, as the bolts stretched and the joint loosened, one side of the joint was more affected by the centrifugal force than the other, causing a shearing action in the joint.

Fig. 9 shows the condition of the shaft and hub at the close of this experiment, a discouraging feature of this sort of work.

The results are summarized in Table V. It will be noticed that the rim speed is about one-half that of a solid wheel, and therefore the centrifugal tension about one-fourth. The joints in all the wheels were carefully made, and were relatively stronger than many joints in fly-wheels which are running today in our mills and shops. The centrifugal tension at the joint would be greater than that given in Table V on account of the weight of flanges and bolts. At a rim speed of 100 ft. per second these wheels would have a factor of safety of about 3.6, which is altogether too small.

#### LINKED JOINTS.

Wheels numbered 16 and 17 were of the familiar rolling-mill type, with the joints connected by steel links over cast-iron lugs, as shown in Fig. 10, the links being heated and shrunk on.

The dimensions of the lugs and links are given in Table VI.

TABLE VI.  
LINKED JOINTS.

No.	LUGS.			LINKS				RIM.	
	Breadth, Ine.	Length, Ins.	Area, Sq. Ins.	Number Used.	Effect Breadth, Ins.	Thickness, Ins.	Effective Area, Sq. Ins.	Max. Area, Sq. Ins.	Net Area, Sq. Ins.
16	.45	1.0	.45	3	.57	.327	.186	2.45	1.98
17	.44	.98	.43	2	.54	.380	.205	2.45	1.98

#### BY TESTING MACHINE.

Tensile strength of cast-iron = 19,600.  
Transverse strength of cast-iron = 40,400.  
Av. tensile strength of each link = 10,180.

TABLE VII  
FAILURE OF LINKED JOINTS.

No.	Strength of Links, Lbs.	Strength of Rim, Lbs.	BURSTING SPEED.		CENT. TENSION.		Remarks.
			Rev. per Min.	Ft. per Sec. = $v$ .	Per Sq. In. = $\frac{v^2}{10}$	Total.	
16	30,540	38,800	3,060	320	10,240	25,100	Rim broke.
17	20,360	38,800	2,750	290	8,410	20,600	Lugs and rim broke.

Wheel No. 16 had three links to each joint, one on each face and one inside. This wheel burst at a speed of 3,060 r. p. m., or 320 ft. per second. Each joint broke on one side, through the rim, without shearing the lugs or breaking the links, as may be seen from Fig. 11.

In No. 17 the link was omitted from the inner lug, leaving but two links to each joint. This wheel burst at a speed of 2,750 r. p. m., or 290 ft. per second, in the manner shown in Fig. 12. On one side the rim broke as in No. 16; on the other side the lugs failed by breaking off. It is impossible to say which joint failed first. It is thus seen that No. 16, with three links, broke at a speed 66 per cent in excess, and No. 17, with two links, at a speed over 50 per cent in excess of that of the wheels with flanged joints.

From the summary in Table VII it will be noticed that the strength of the rim at the weakest section is apparently in excess of the strength of the links, whereas it was the rim that failed in each case. It must, however, be remembered that the links were under direct tension, while the rim was subjected to bending in addition.

At 100 ft. per second the factors of safety for Nos. 16 and 17 would be 10.25 and 8.4 respectively.



CONCLUSIONS.

1. Fly-wheels with solid rims, of the proportions usual among engine builders and having the usual number of arms, have a sufficient factor of safety at a rim speed of 100 ft. per second if the iron is of good quality and there are no serious cooling strains.

In such wheels the bending due to centrifugal force is slight, and may safely be disregarded.

2. Rim joints midway between the arms are a serious defect and reduce the factor of safety very materially. Such joints are as serious mistakes in design as would be a joint in the middle of a girder under a heavy load.

3. Joints made in the ordinary manner, with internal flanges and bolts, are probably the worst that could be devised for this

METROPOLITAN, CHICAGO, ORDERED SOLD.

On November 10 Judge Showalter, in the United States circuit court, ordered the sale of the Metropolitan West Side Elevated Railroad, of Chicago, at an upset price of \$6,000,000. Twenty days were allowed for the redemption of bonds and stock and the sale will probably take place in January.

The court appointed Dickinson MacAllister receiver for this road on January 29, 1897, and shortly afterwards approved a plan of reorganization, which was adopted by the majority of the bond and stockholders. Frederick P. Olcott, Walter Gookman and Samuel Thorne, of New York, were appointed a com-

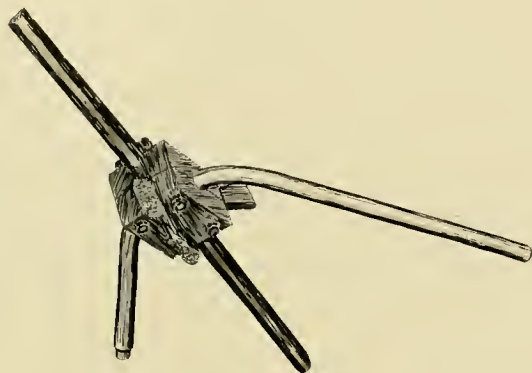


Fig. 9



Fig. 12

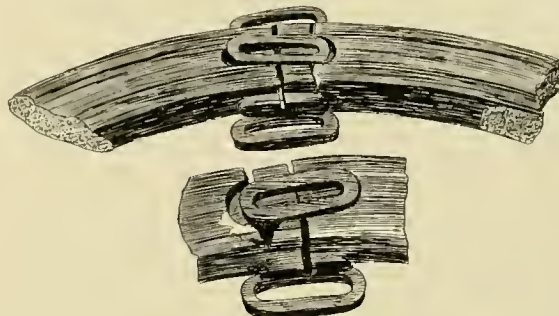


Fig. 11

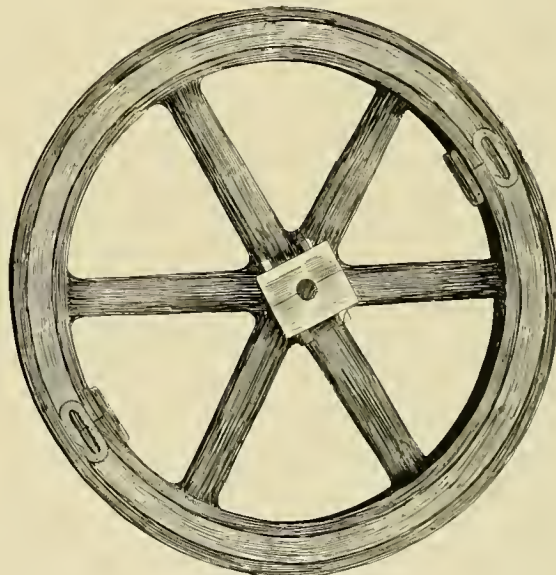


Fig. 10

CAST-IRON FLY-WHEELS AFTER BURSTING.

purpose. Under the most favorable circumstances they have only about one-fourth the strength of the solid rim and are particularly weak against bending.

In several joints of this character, on large fly-wheels, calculation has shown a strength less than one-fifth that of the rim.

4. The type of joint exemplified in Nos. 16 and 17 is probably the best that could be devised for narrow-rimmed wheels not intended to carry belts, and possesses when properly designed a strength about two-thirds that of the solid rim.

It is gratifying to notice the fact that since the subject of joints in fly-wheel rims has been so thoroughly ventilated during the discussions before this Society, several of our prominent engine builders have changed the designs of their wheels by bringing the rim joints opposite the ends of the arms.

The experiments which have just been described, although at times a trifle too exciting, were interesting from first to last. The writer hopes to supplement them by others on models of the more recent rim-joints, and would be glad to receive any suggestions.

The more this subject is agitated, the less shall we have occasion to mourn the destruction of life and property on account of faults in the design of this most necessary element of the steam-engine.

mittee, and it is said their management of affairs gave satisfaction. Stock amounting to \$15,000,000, and bonds aggregating \$14,000,000, were assumed by the committee, and when the reorganization was completed in August the entire amount had been taken in, with the exception of \$250,000 in bonds and \$300,000 in stock.

In addition to the indebtedness of the company on its bond issue there is due a further sum of \$1,552,675, representing interest which has accrued on the principal. The decree stipulates that this amount shall be paid within 20 days to Adrian Iselin, Jr., and George G. Haven (the complainants in the bill asking for a receiver) for the benefit of the outstanding bondholders.

E. B. Sherman was appointed special master to execute the decree of sale.

The traffic on the Metropolitan has been steadily increasing and at the present time the daily average is over 60,000. An addition to the power house is building and over 20 new motor cars have been recently added to the equipment. The operation of the road has been under the same management since the receivership as before; W. E. Baker, formerly general manager, being the superintendent for the receiver, and having conducted operations in a manner which added new laurels to his already highly successful record.

## ENGLISH OPINIONS OF CONDUITS AND ACCUMULATORS.

At the meeting of the Municipal Electrical Association (English) two papers on the subject of electric traction were read and discussed, and some of the opinions expressed by the authors and others on conduit and accumulator roads will doubtless prove of interest to American readers.

R. C. Quin, borough electrical engineer of Blackpool, after treating of the roadbed, motors, cars and system of feed in his paper, proceeded as follows:

**"Conduit.**—The local conditions necessary for the successful working of a conduit system are, the author considers, freedom from sand and mud on the roads, good drainage, and a wide slot. The conductor should not be visible from the surface of the street, and should be frequently supported on insulators. It is necessary to have a wide groove, in order to obtain an efficient form of collector or plough, as not only has it to contain the insulated conductors, but it must also be mechanically strong. The groove of the conduit should in all cases be parallel to the lines, and the conductor should not be continued across the points or cross-overs, as in these cases it would necessarily be exposed.

"Generally conduits contain two insulated conductors, and this to the author seems preferable. It cannot be said that conduit systems have up to the present been successful enough to warrant their general adoption. Recently the author inspected four different conduit systems, but only two of these were then working.

"The initial cost of a conduit system varies from 30 to 200 per cent in excess of the cost of an overhead system, and the up-keep, even where the conditions are favourable, is about 10 per cent greater than with the overhead.

**"Accumulators.**—The accumulator system of traction certainly possesses very great advantages—the principal of which is that the service of cars is not dependent on the maintenance of one system of feed, each car being entirely independent; but we have carefully to consider at what cost this independence is obtained. The crux of the whole question is the cost of carrying a useful load of passengers a certain distance, and for this purpose it is as well to see how the question is affected by the adoption of storage cells. There are three heads under which additional expenditure is entailed—first, the interest upon the additional capital required for the installation of the cells and also their depreciation; second, the cost of propelling the additional dead load; third, the inefficiency of the cells.

"With cars running all day with one charge the weight and cost of cells are both very great, as a comparison of the cars used in Dresden for overhead line only, and of the cars at Charlottenburg for accumulators, will testify. Dresden cars carrying 40 passengers weigh 8 tons; Charlottenburg cars carrying 42 passengers weigh 23 tons. In both cases the useful load of passengers is approximately 3 tons. The cost of the accumulators used on the latter cars is about £750 per car. The cost of traction accumulators varies from £75 to £125 per ton, the former figure being for rapid charging and discharging short-distance cells.

"The author was much interested in the statements made by Mr. Epstein in his Institution paper (on the authority, he believes, of the Hanover Tramway Company) that the cost of the accumulator system of working there was only .2d. per car mile greater than the overhead system; and he must confess when making his recent visit to Hanover he did so with the intention of ascertaining how that .2d. was arrived at. To a certain extent he was unsuccessful, the cost of the up-keep of the cells not being obtainable; but he believes that the figures which he has obtained are sufficient effectually to disprove that statement.

"There is in Hanover one line of rather less than 10 miles worked entirely by accumulators—the cars working that line being also equipped for the overhead, so that they are interchangeable with cars working on the combined system. They weigh 11½ tons and carry 36 passengers. The time occupied in running this journey, exclusive of charging and stoppages, is 45 minutes. The cells are charged at two stations en route, at one of which

eight minutes charge is given at constant potential, and at the other 25 minutes. The accumulators are placed under the seats, each car being fitted with 208 cells of Tudor type, and there are three plates in each cell. The weight of these cells is approximately two tons, and the installation cost of each car £200. The energy taken per car-mile on this track was 1.5 units. Although the up-keep cost of the cells was not obtainable, the average life of the cells was given at about 18 months, and, moreover, additional cars have to be provided on the accumulator line, as several cars are always occupied charging.

"There is also another line at Hanover worked on the overhead system. Here the cars carry thirty-two passengers and weigh 6 tons. The energy taken per car-mile of these latter cars was .68 units. On the combined overhead and accumulator system, with cars similar to those in use on the accumulator line, the energy taken per car-mile was 1.37 units.

"Leaving the initial cost of the accumulators out of the question, there is the effect on the revenue account to be considered. With rapid-charging low-capacity cells (which are really the only ones worth considering) the weight of cells for a five miles journey with one charge is about 1 ton for every ¾ tons of car and passengers. Therefore with a car and passenger load of 13 tons we must have 4 tons of accumulators. As every ton mile on a given road requires the same expenditure of energy, it follows that the energy given to the motors to propel this car will have to be increased approximately 30 per cent. Opinions differ as to the efficiency of these cells, but generally the users of them consider that the watt-hour efficiency is about 60 per cent, and the author does not think the figure is far wrong. Therefore the energy of charging these car-carried cells has to be increased 117 per cent owing to their inefficiency and weight. Further, the wear and tear of the road and cars is increased by the additional weight.

"The life of the plates of the cells is variously given by the users as from one to two years, by the representatives of the makers as from two to three years; but the majority of the users do not find much difference between the life of positive and negative plates. The cost of the up-keep of cells is given by the various tramway companies using them at from ¾d. to 3¼d. per car-mile, and the author thinks a fair average may be taken at 1½d. Assuming the cost of current to be .75d. per unit, and .7 of a unit to be taken without cells, figures the author does not think advocates of accumulators will cavil at, the cost of energy with the overhead system would amount to .525d., and with accumulators to 1.14d., or an additional cost of .62d. This added to 1½d. for the up-keep of the cells per car-mile gives us the additional cost of 2.12d., neglecting the extra wear and tear of the cars and road.

"Now consider the capital cost. The overhead system per mile of double track costs complete, including bonding of the rails, steel posts (on span wire or bracket system) about £1,600. If these posts are used for street lighting purposes, the cost of the posts should be divided equally under the two heads, reducing the overhead cost to £1,000 per mile of double track. With a two and a half minutes service and cars traveling eight miles per hour there will be six cars on the mile section, and with the weight of the accumulators given, each car would cost £300 to equip, or £1,800 per mile of double track. Again, if charging stations were adopted with say 15 minutes charge, six additional cars would be required at an additional cost per mile of £560, making altogether a sum of £2,360 per mile. With a slow service of cars the initial cost of the accumulators would probably be less than the overhead, but the additional cost of 2.12d. per car-mile (with only 20,000 miles per car per annum) capitalized is equivalent to the sum of £3,530 bearing 5 per cent interest for each car running.

**"Combined Systems.**—Various combinations of the three systems before enumerated have been adopted. More generally it is a combination of the overhead line and accumulator system, but in all cases of which the author has cognizance the adoption of accumulator systems has been not a matter of choice but of necessity.

"When the necessity arises the author would desire to point out most strongly that the dead load of the cars in proportion to



its useful load should be as small as is compatible with stability of structure. That arrangements should be made that the additional dead load of the accumulators is carried only so far as is absolutely necessary. It is therefore advisable so to arrange the battery that it can be detached as a whole from the car at the junction from the overhead line.

"A great deal has been said from time to time as to the effect of the acid upon the cars and trucks, and of the odor of sulphuric acid which pervades the cars when the cells are placed under the seats. From what the author has seen of modern systems constructed on these lines, he can give his assurance that these complaints are not well founded; and, if it were not for the inconvenience of detaching the battery as a whole from the car under these circumstances, he would certainly recommend the cells being placed beneath the seats.

"Where the conditions are such as would permit of the working of a conduit system, and in the absence of permission to use the overhead, the author considers the combination of overhead and conduit much more preferable than the use of accumulators. The additional weight carried is negligible, and the working cost decidedly lower than with accumulators.

"There have been many attempts to devise improved methods of electric traction, to obviate the disadvantages of the systems above enumerated, but they one and all have drawbacks peculiarly their own which have hitherto prevented their general adoption. The names of these systems are legion.

"The conclusions arrived at by the author all tend to the opinion that in the present state of electric traction engineering there is but one good and reliable and cheap system, and that is the overhead. Where a combination is necessary and conditions are favourable, overhead and conduit combined comes next in order of merit. That as at present constructed accumulators are not, from a commercial point of view, a satisfactory solution of the traction problem."

J. E. Stewart, borough electrical engineer of Derby, in his paper had this to say on conduits and accumulators:

**Conduits.**—The opinion expressed almost universally is that they are for various reasons undesirable—more especially where an ordinary system of horse traction is now laid down—as the cost of the conversion is so great that it practically makes it impossible to make any adequate return upon the capital outlay, perhaps with the exception of where the traffic is so great that there is practically a continuous stream of cars passing, but it certainly would be out of the question in outlying districts. The enormous disturbance necessary to the streets is also a very serious matter, and the dislocation of the traffic during the course of the works, leaving out altogether the question of the cost. Drainage is also a difficult matter—the cleaning of the conduit a constant source of expense. Children's hoops and such-like matter getting into the conduit are causes that make for damage to the collectors and stoppage of the cars. Cushion tire and solid tired bicycles would be wrecked, and personal damage done to the riders—not to speak of the modern narrow-tired carriage wheel.

**Accumulators.**—The great advantages of this system are that any car is self contained; the speed can be varied considerably—not necessarily requiring any disturbance of the existing road, although I fear there are few roads in the country upon which it would be economical or safe to run accumulator cars without relaying the rails, for these reasons:

"The great weight of the cars, and also the necessity of much stouter rails when vehicles are self-propelled. This is common to any sort of electrical traction, of course, more so with accumulator cars, owing, as before said, to the great weight of the cars; also the average tramway groove is not deep enough for self-propelled traffic.

"The disadvantages are:

"Great weight—about 30 per cent of the total weight being taken up in the weight of the accumulators—which have to be carried whether the car is carrying one passenger or is fully loaded.

"The fact that it is practically impossible with our present ex-

perience to work satisfactorily on hilly roads, and the inability of attaching trailing cars—owing to the rapid deterioration of the accumulators.

"The necessity of having to take the cars off the road for the purpose of having another set of cells put on board the car.

"Smell of acid which will certainly get into the car; and it is very objectionable—it having the tendency of causing sneezing and consequent large absorption of whisky to keep off the influenza which people are inclined to believe they have caught in consequence.

"Rapid deterioration of the plates, and consequent heavy cost to keep up. This item alone is the principal cause of the want of success.

"The course of construction is somewhat on a par with the overhead system, varying with the number of cars run per hour.

"Systems depending upon automatic devices for the purpose of making contact at stated places as the car passes over, or on which one has to rely for the purpose of making the disconnection, are for obvious reasons out of the question—even if the only reason was the great number of such automatic devices necessary and the likelihood or possibility at any time of one not acting properly, thereby causing a pressure of 500 volts to be exposed on the road for all and sundry to come in contact with."

Mr. Stewart advocated the municipalization of tramways at once; in the discussion was opposed in this by J. S. Raworth because of the complications which would arise in administering large electric systems by a multitude of committees. The municipalization of an electric line was stated to be a very different and much more serious affair from the municipalization of a horse road.

Councillor Brodie, of Blackpool, in the discussion gave the experience of the Blackpool Corporation with its conduit road, which in substance was: "It was not seven years since the company that put it down was glad to get rid of it by handing it over to the corporation. About the next thing the corporation had to do after taking over its electric tramway was to buy horses to run it. It cost £2,000 to repair the conduit. Two years ago they estimated they would take £13,000, and could give £2,000 to the rates. They took £15,000, and found there was only £230 to go to the rates. They were disappointed. All the profits went in repairs and leakage. They were convinced that they must change over to the trolley wire, and made application to the Board of Trade. There was opposition at the inquiry, and as a result the Board of Trade told them to use accumulators. A deputation went to the Continent to see what could be done with accumulators; and the result of the trip was that, among other things, the deputation came to the conclusion that the weight of the accumulator would be such that they could not run with it upon their sandy foundation at Blackpool as they had been advised to do by the Board of Trade. They had tried the Board of Trade, again, and had no doubt that in the end they would get consent to an overhead system. If they did not get it he did not know what they would do. The conduit was quite ready to swallow up an indefinite number of thousands of pounds more."

## TROLLEYS FOR PORTO RICO.

Gen. Roy Stone is reported as favoring a system of electric railways as the best means of providing means of transportation for the rural districts of Porto Rico. The roads there are in general miserable affairs and it is doubtful whether the island will ever have a complete system of wagon roads. The mountainous character of the country and the heavy rainfall require the most thorough drainage and carefully made foundations for roads worthy of name, and the cost of the present military road across the island is estimated at \$100,000 per mile.

There are numerous water falls which would furnish the power necessary; this is an important feature, as the cost of coal is so high as to prohibit the use of steam power.



## ACCOUNTANTS' ASSOCIATION LIBRARY OF BLANKS AND FORMS.

One of the most interesting and instructive features of the very first meeting of the accountants, held in Cleveland for organization, was the collection of forms and blanks. This exhibit has been made at each of the succeeding meetings and this year reached large proportions—so large that a permanent committee was found necessary to take charge of and classify the contributions. As this in an undertaking in which each exhibitor has the examination of that of all the other members, the following call by the secretary should be responded to fully and promptly. In this case the proverbial comparison is anything but odious, and in no other way can improvements in form and economics in methods be more readily accomplished. The notice to members reads as follows:

Dear Sir:

A new departure is about to be attempted by this Association, a departure which we believe will add to the usefulness and consistency of purpose for which we were organized, and to make the idea a success and of practical value the co-operation of every member of the Association is required. We refer to the department of blanks and forms. In conformity with a resolution passed at the Boston convention that every member be requested to furnish the secretary with two copies of each and every blank and form in use upon its road, and as rapidly as any forms are issued two copies of the same shall be forwarded for filing and use of the department. These forms to be arranged and classified constituting a permanent and practical exhibition to be displayed in some helpful manner at each succeeding convention of this Association, and in the interim between conventions they are to be subject to the request of the members of the Association. Thus it is hoped to establish a department of such value that we will make the Association greater and of still more permanent value to its members.

It is further intended that these blanks and the annual exhibition of them will be held strictly for members only, therefore each one contributing may rest assured that whatever blanks

copies of each of your blanks and ask you to please observe the following suggestions:

1st. Do not fold blanks more than absolutely necessary (rolling preferred.)

2d. Write in ink the name of your company upon all blanks where the same does not appear.

3d. Should any blanks not have their use clearly shown thereon please give a synopsis for what they are intended to be used.

4th. The term "Blanks and Forms" is intended to cover everything used by your company including special ruled books and tickets.

5th. Address your package to W. B. Brockway, secretary, 106 Summit street, Toledo, Ohio, and advise by letter of the forwarding of the package.

Yours very truly,

W. B. BROCKWAY,  
Secretary.

J. F. CALDERWOOD,

President.

## ROADBED OVER A SEWER.

The Metropolitan Street Railway Company, of New York, in building its electric conduit in Canal street, encountered an unusual obstacle in the sewer which could not be lowered and the roof of which was too close to the street surface to permit the conduit construction over it. Canal street was originally, that is, in the early part of the century, a canal running from Broadway to North river, and used for commercial purposes as well as for draining the contiguous territory; either side of the 40-ft. canal was an esplanade 30 ft. wide.

Later the canal was replaced by an underground sewer which is 20 ft. wide and in which the flow is seldom less than 12 ft. deep. This sewer drains a large area and the flow in it is steady and rapid. It being out of the question to move the sewer, it was decided to remove the arch at the top and substitute a flat



VIEWS OF THE WORK AT WEST BROADWAY AND CANAL STREET.

are supplied to the department will be used solely for the benefit of the members of the Association.

Any member desiring to prepare a form for any particular purpose will appreciate the value of having at his disposal hundreds of blanks pertaining to the subject which he has under consideration. The accessibility of these forms arranged as we propose to have them is alone worth the annual membership fee of our Association.

That these plans may be carried into effect promptly we ask your co-operation by kindly furnishing at an early date two

roof, the city engineers finding that this would not reduce the capacity.

From Church street to Sullivan street the roof was thus changed. The sewer was first uncovered for a distance of 200 ft., beginning at Church street, and when the arched brickwork was exposed it was removed piecemeal, care being taken that none of the debris fell into the sewer. When an opening was made a platform of planking was laid over the water and extended as the work progressed. Then the beginning of the platform was gradually removed and an excavation made on each side behind



the sewer walls. By first laying a sufficient foundation of concrete the walls of the sewer were strengthened by a reinforcement of the brick wall, and on the top of the new works were placed blocks of cut granite at close intervals. Steel girders were laid on these stone blocks and cross sections of arched brick work were built, making a flat roof 5 ft. above the highest flow of the sewer.

It was also necessary to lower all of the water and gas mains crossing the line of the sewer. At West Broadway and Canal street the water mains are 24 in. in diameter and there are several lines of pipe. The arched roof of the sewer was removed



BUILDING THE CONDUIT.

for a distance of 60 ft. and the pipes suspended by chains from beams. After cutting off the pipes, the flat roof was laid over the sewer as above described and new pipe connections running under the sewer put in.

The details of the work are very ingenious and proved quite successful, though the cost is high. The illustrations are from photographs taken during the progress of the work.

### CONSOLIDATION AT ST. LOUIS.

Reports from St. Louis state that by January 1 arrangements for the consolidation of the Lindell and Missouri street railway systems will be complete. The Lindell Railway Company controls and operates the Compton Heights, Union Depot & Merchants' Terminal Railway and the Taylor Avenue Street Railway, and owns the property of the Missouri Railroad Company, which latter company operates the Forest Park & Laclède Avenue road. Mr. Whitaker is president of the Lindell and president and general manager of the Missouri.

It is expected that the consolidated lines will be incorporated for \$10,000,000, the highest possible amount under the state law, which says no Missouri corporation shall have a capital stock to exceed that sum. The present capital stock of the five roads is \$6,400,000, and they are bonded for \$3,700,000.

The difference between the total capital of the five roads—\$6,400,000—and the \$10,000,000 at which it is proposed to incorporate the consolidation is \$3,600,000. This will be made up by turning over the Missouri line at the price paid for it by Messrs. Whitaker, McClure and others over a year ago, which was nearly \$2,000,000 more than the capital stock, and by turning over the Forest Park & Laclède line at its actual value, instead of for its nominal \$100,000 of capital stock.

When the consolidation is completed the Lindell Company will

have five power houses, and will be the largest street railway system in St. Louis. Transfers will be issued at 20 crossing points. In 1899 and 1900 the company must pay the city \$14,000 a year. For the next five years \$28,000, for the succeeding 10 years \$32,000 a year, and after that 3, 3½ and 4 per cent of its gross earnings, divided into equal periods, until its franchise shall have expired.

The ordinance providing for the consolidation, approved by the Mayor last month, must be accepted within 90 days after its passage, and the company must file a bond of \$50,000 for faithful compliance with its obligations.

### DEPRECIATION OF MACHINERY AND EQUIPMENT OF STREET RAILWAYS.

One question which comes to the street railway investor and to the general manager is, how long will the power station machinery, the cars and motors and line material last? This has been carefully estimated for the Chicago City Railway Company by G. W. Knox, electrical engineer, his figures being based on the renewals and per cent of wear.

In some particulars the following table seems to give an unusually long life for certain portions of the equipment which past experience does not warrant. Many companies have reconstructed their roadbeds after five or six years; the two and four-pole generators which were in universal use eight years ago have been replaced by modern machines; there are few cars and trucks 10 years of age still in service. However, the figures are based on life of the present equipment which, from the engines to the rail bonds, is in every particular more substantial and durable than that of five years ago. The table gives the depreciation in per cent per annum.

	Power Station.		
	Per Cent.	Per Cent.	
Engines .....	8	Generators .....	3
Boilers .....	8	Building .....	5
	Cable Machinery.		
Cable Machinery .....	10	Cables .....	175
	Roadbed.		
Rails .....	5.5	Paving, Brick .....	7
Ties .....	7	Paving, Asphalt .....	7
Paving, Granite .....	5	Paving, Macadam .....	6
Paving, Cedar Block.....	16		
	Cars.		
Car Bodies .....	7	Trucks .....	8
	Rolling Stock.		
Armatures .....	33	Wiring and other electrical	
Fields .....	12	Equipment on Cars.....	8
Gear Cases .....	20	Commutators .....	33
Controllers .....	4		
	Line Equipment.		
Poles, Iron .....	4	Trolley Wire .....	5
Poles, Wood .....	8	Trolley, Insulation .....	7
Insulation .....	12	Bonding .....	8

### NEW YORK WHARF & WAREHOUSE COMPANY.

A recent West Virginia incorporation is the New York Wharf & Warehouse Company, which was granted a charter for the purpose of constructing and operating elevated railways, motor cars, docks, wharves, warehouses and piers, operating telephone and telegraph lines, and maintaining ferries between New York City and Yonkers and points in New Jersey.

The capital subscribed is \$50,000, with the privilege of increasing the same to \$500,000 in all. The shares are held by Stephen M. Hoyer, William W. Fish, John N. McDonald, Charles H. Friganza, William Meserole, John Steinway, Jr., and Edward L. Somerville, of Brooklyn.

The gentlemen who are behind this company are not known, nor is the particular object of the company. A new trolley road in Brooklyn and the consolidation of traffic on the state canals are named as among possible or probable plans.



## ADVENT OF THE ENGINEER.

C. W. Hunt, president of the American Society of Mechanical Engineers, in his annual address at the last meeting of the Society spoke as follows upon the advent of the engineer and the effect of his profession upon his mind and character:

"Turning now to the effects of this accumulation of scientific literature available to all alike, and the results following its application by organized methods of procedure, our first glance will show prominently the wonderful and rapid increase of the importance of engineering in our industrial life. It has transformed almost every phase of it, and put into our hands materials and processes which make the actual life of our immediate ancestors seem primitive by comparison.

"Commencing under adverse conditions and developing in a field of restricted capital, with scarce and high-priced labor, engineering in America has applied the forces and materials of nature to the uses of man in a characteristic way. Freedom from mediaeval traditions and the hampering conditions found in the older countries, left them substantially free in the choice of means to accomplish their end. Influenced as our engineering has been by the experience and the work of other parts of the world, yet we cannot escape the fact that its development was essentially independent, and in some phases unique. Improvement has followed improvement in technical matters, profits and savings have been added to the capital invested in our industries until the continent, two hundred years ago an untraversed wilderness—one hundred years ago a struggling nation—struggling with industrial difficulties and serious political problems—has triumphed over these early limitations, and has developed into a nation which, in numbers, prosperity, and wealth takes a prominent position among the great nations of the world.

"Whichever way we turn, we are met by a scene of marvelous changes, which have followed the advent of the engineer on the scene. A view of one subject will in a measure serve to represent these changes, and to recall similar illustrations to your minds which differ from this only in degree.

"It is but a few years, well within the memory of men now living, that our navy and all the other navies of the world were composed of sailing ships. In one of these vessels a mechanical germ was introduced in the form of a steam engine and an engineer. The grave question soon arose as to what should be the status of the new intrusion into the personnel of the ship, the engineer. This factor, which was soon to revolutionize the navy, was considered quite important at that time, as is shown by the first official record on this subject in the Navy Department at Washington, stating that it would seem that such persons should be exempt from the penalty of corporal punishment.

"The engine grew in size with each succeeding vessel, and as it increased, the sails correspondingly shrank, until finally they disappeared altogether. New mechanical germs soon found a lodgment in other parts of the ship, which in a few years have so developed that hydraulic and pneumatic pressures are produced, and electric currents are generated and distributed, to govern the rudder, hoist the anchor, ventilate the compartments, energize the combustion, revolve the turrets, train and control the guns, handle the ammunition, and purge the ocean's water of its impurities, making it wholesome for the ship's use. Following these in quick succession came incandescent lamps and search lights, breech loading and rapid-fire guns, multi-charge automatic guns, and mobile torpedoes, one mechanical appliance rapidly following another, until the sailing ship of the line, which but just now embodied the result of hundreds of years of thought and experiment, has been completely transformed, from keel to topmast, into a vast machine, controlled and operated even to the least important function, not by sailors, but by mechanics.

"In every phase of our industrial life the changes wrought by the engineer are quite as evident; for instance, note the changes in the manufacture of steel, development of electric locomotion, in iron construction in buildings, in machine tools, in agricultural implements, in sewing machines, in textile industries, and in electric metallurgy.

"The life of the engineer has a full measure of the labors, the trials, discomforts, and the disappointments which are found in this, as in every other walk of life. But it also has the successes

which come from well-directed labors. It is not, however, either the useful work or the successes of life which bring happiness. It is man's ideals which make him happy. Let us together survey some of the surrounding influences which tend to give high ideals of life to the engineer, no matter what the vexatious of the moment may be. We will pass in review the interesting character of his daily work, his pure-minded associates, the fascinating scenes, and the higher pleasures of life by which he is surrounded. We will then better appreciate with what elevated emotions a father can lead a son, or a teacher his pupil, to the path of an engineering life, and place in his hands the mathematical, chemical, and physical implements to enter upon a work which will bring him both pleasure and honor.

"Whichever way engineering may develop as time rolls on, its elevating influences are constantly at work on the mind and on the character. The work is carried on under unchangeable laws, which must be rigorously applied and adhered to, or failure is sure to result. Man builds to master, to resist, or to guide the forces of nature. If he has rightly judged the conditions, his work stands as a permanent monument of the fact; but if otherwise, the irresistible laws of nature will develop the defect and discover his ignorance, incompetence, or error to every observer.

"Hence he laboriously seeks out the unseen laws and forces, then expresses the revelation in a workable form for his daily use. He tests his materials with painstaking refinement. He measures electric resistances with an accuracy now reaching the point of one in four millions, time to the one three millionth part of a unit, divides a circle with a mean error not exceeding the one-millionth of the circumference, makes surfaces 6 in. square with a variation from absolute flatness of less than one two hundred thousandth of an inch, rules lines which vary from absolutely perfect spacing by only one three-millionth part of an inch, sees clearly the spectrum of samarium when one part is diluted with three million parts of lime, and surveys lines 11 miles long in the open air with an average variation in three measurements of only four-tenths of an inch.

"The effect of living and working in such a sphere of action, where it is inconceivable that an engineer could knowingly be otherwise than exact in his work, should tend to influence the whole trend of his life and character, and make them to a greater or less degree a reflex of his daily work. He of all men has the most unchangeable and exalted basis for his ethics—the clearest of all knowledge of the disastrous results which will surely follow the violation of law. The very qualities of his mind which makes his work a pleasure and a success will all tend to bring his every act into compliance with the inexorable laws of the universe. If it is otherwise, and his conduct is not guided by the laws of right doing and right thinking, and his ethics not in accordance with them, then, and to that extent, he is not an engineer—not one who is skilled in the application of the forces of nature to the uses of man."

## BIRMINGHAM TRACTION COMPANY ATHLETIC PARK.

By an arrangement between the Birmingham (Ala.) Traction Company and the Birmingham Athletic Club, the former will have an athletic park at North Birmingham. Work was commenced about the middle of November, and by Thanksgiving day the grand stand and bleachers were erected, the first game of foot ball being played at the park that day. This is an improvement which was very desirable, as the old ball park has been occupied by a bicycle track.

The new park is to be enclosed with a high fence, and the Club has agreed to have all its base ball and foot ball games and other out-door sports there.

## ACCIDENT AT GAS CITY, IND.

November 25, a passenger train on the Pittsburg, Cincinnati, Chicago & St. Louis Railroad struck a street car at the crossing of Main street, in Gas City, Ind. There were 17 passengers in the car, seven of whom were more or less seriously injured; the motorman was stated to be fatally injured.



## TEST OF HARVARD POWER STATION, BOSTON.

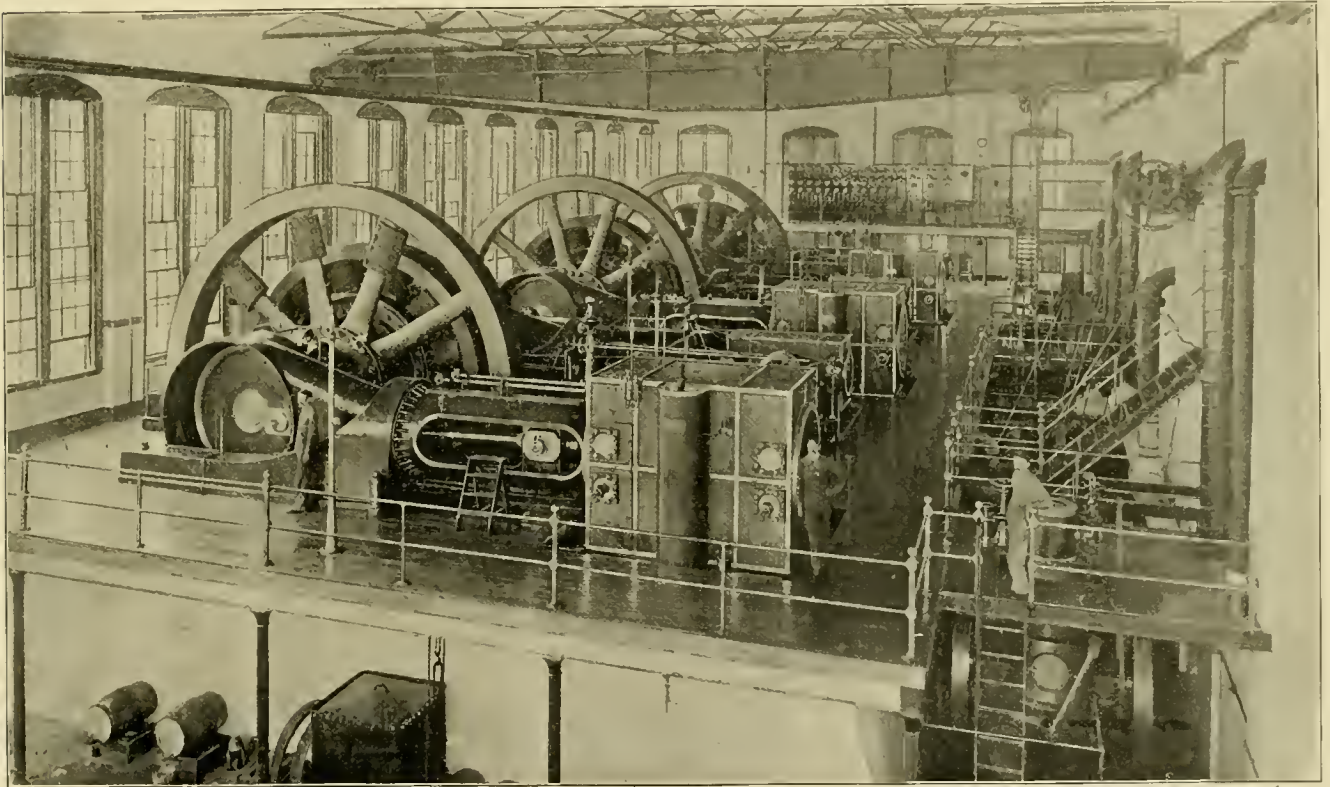
An elaborate test, extending over 45 hours, was made of the Harvard power station of the Boston Elevated Railway Company, by the senior engineering students of the Massachusetts Institute of Technology, May 10-12, and the report of the test was published in the September issue of the "Technology Quarterly," to which we are indebted for the data. The Harvard station is the latest built by the company and is a model of its kind in simplicity, arrangement and labor saving facilities. It is located in Cambridge near Harvard square and not far from the Charles river.

The building is an imposing structure of brick with granite trimmings and is 171 ft. long by 125 ft. wide. A future exten-

pushed into the boiler room where the coal is shoveled direct into the furnaces. The boilers are fed by power plunger pumps located in the basement of the engine room, and are driven from a counter shaft run by an electric motor.

The three main engines have cylinders 28 and 56 by 60 in., and are cross compound, jet condensing, made by the E. P. Allis Company, each having a nominal capacity of 1,800 h. p. Each fly-wheel is 24 ft. in diameter and made of built up segments weighing 60 tons. The engines are set sufficiently high on the foundations to allow all the steam and exhaust piping to be placed beneath the engine room floor.

The separators are just below the throttle. The exhaust from the high pressure cylinder passes into a vertical receiver and into the low pressure cylinder, and the exhaust from the low pressure cylinder passes through a feed-water heater and into the condenser. The feed water is drawn through a 6-in. pipe



ENGINE ROOM—HARVARD POWER STATION.

sion of 71 ft. in length is contemplated. Great care was taken in putting in solid foundations, piles being driven to a depth of 35 ft., and a bed of cement concrete was laid on top of these to support the foundations of the stack and machines.

The smoke stack, built on granite masonry, is 20 ft. in external diameter at the base, tapering to 16 ft. diameter at the top, and is 226 ft. in height. The interior, which is 11 ft. in diameter, is lined with fire brick 50 ft. up from the base. Each boiler is connected with a main flue, extending along the boiler room, which joins a square brick flue containing a Green economizer of 560 tubes which have a heating surface of 6,720 sq. ft.

The boiler room, 56 ft. by 171 ft., has six Babcock & Wilcox water tube boilers in three batteries having a total capacity of 3,000 h. p. Each boiler has three water drums 42 in. in diameter and 22 ft. in length with safety valves set at 175 lbs. Extension furnaces provide large combustion chambers for the boilers. The coal handling facilities are complete. The coal cars are hauled from the large storage bins by electric locomotives up an inclined trestle and around a loop and dumped into bins at the rear of the power house. Tracks are laid beneath these bins and small cars receive the coal through hoppers and are

from the city mains and after passing through the heaters on the exhaust into the economizer and to the suction side of the pumps and thence into the boilers. In this way the economizer The magnesio asbestos sectional covering to the feed pipes was furnished by H. W. Johns Manufacturing Company.

The drip from the separators on the steam mains is connected to the suction side of the pumps, but the drip from the receivers contains oil and is drained off as waste. There is an independent condenser and air pump for each of the main engines. A 7-ton traveling crane runs the length of the engine room on girder tracks built into the side walls of the building.

The air pumps draw the condensing water from the Charles river, 300 ft. away, through a 20-in. pipe. About 100 ft. from the station the suction and discharge pipes of the pumps are connected by cross-overs and valves, so that the outer end of either pipe may be used as suction or discharge.

The engines are direct connected to 12-pole generators of 1,200 k. w. capacity running at 80 r. p. m. The normal output of each machine is 2,180 amperes at 550 volts. Wooden blocks insulate the generator frames from the foundation plates. The three generators are connected to the switchboard by six cables of

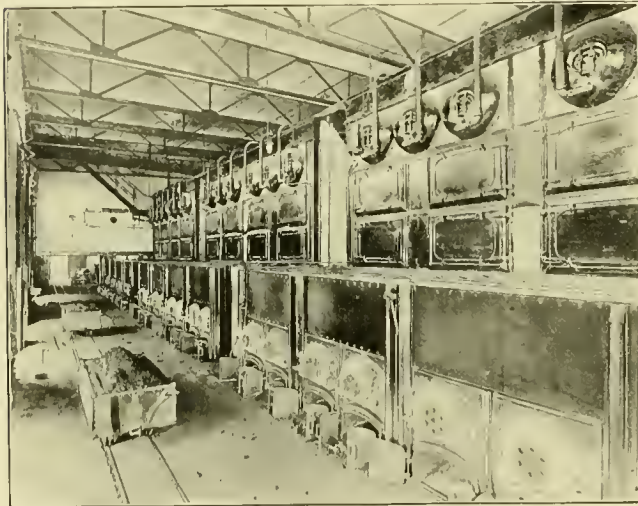


1,000,000 c. m. p. each. There are 16 panels to the switchboard, one for the station, three for the generators, and the remainder for feeders. The usual complement of switches, circuit breakers, wattmeters, voltmeters and ammeters, of the Weston type, are mounted on slate panels.

The test was divided into four watches of 11¼ hours each, 24 observers working in each watch.

Lazy-tongs were attached to each crosshead to give the proper reduction of piston motion for 2-in. diameter drums on the indicators. Indicators were attached to each end of the cylinders of main engines. No. 2 and No. 3, the ones used during the test. Air-pump engines No. 2 and No. 3 were each piped up with three-way cocks. The motion for the drums of these indicators was taken from a pin screwed into the end of the shaft. Although this does not give a correct motion, it was considered to be sufficiently accurate, as the horse power of these engines is not considered in the subsequent calculation.

The drips from the receivers were caught in a tank on scales and weighed. The drip pipes from the separators were each



BOILER ROOM—HARVARD POWER STATION.

disconnected from the traps and each connected with a steel reservoir about 16 in. in diameter and 48 in. in height, having on the side a gage glass and scale giving the capacity between different levels. From time to time the levels were blown down by opening valves in the bottom, the discharge going into the suction pipe of the power pumps.

The feed-water pipe was broken at the pumps on the suction side, and the suction pipe changed so as to draw from three large barrels placed alongside the pumps. A check valve opening towards the pumps was placed in the suction pipe close to the barrels. The discharge from the separators was connected between this check valve and the pumps.

The regular suction pipe was carried up to the floor above and supplied four large barrels used for weighing. These barrels discharged into the three below connected with the suction of the pumps. The four weighing barrels were supplied from the city main with water which had passed through the heaters on the exhaust pipe. Ordinarily the water went through the economizer as well, before entering the pumps. During the test the pumps forced the water through the economizer into the boiler. It will be noticed that the temperature of the feed water entering the economizer is less, by a few degrees, than when leaving the heater on the exhaust pipe. This loss is due to the exposure to the air while weighing. Wooden scales were attached to the water glasses on the boilers.

Calorimeters were placed on the main steam pipe from each battery and near the throttle of No. 2 or No. 3 engine.

Holes for flue thermometers and draught gauges were made at

each end of the economizer, and connections for sampling flue gases were made at the entrance end.

The coal scales were tested. The different gages at the gage boards in the engine room were tested and the corrections noted. With one exception, all connections on the feed water piping, where there was a possibility of leakage, were broken and blanked.

The place referred to as not being blanked was where an auxiliary steam pump connected with the line. There were two Chapman valves here, one either side of the connection. A pet-cock was tapped into the pipe between these valves and left open, so that any leakage would be noticed.

A weir box 10 ft. long, and having a weir 3 ft. wide, without end contractions, was placed at the end of the auxiliary discharge pipe for condensing water. The pass valves were changed so as to send the water over the weir. The height of water on the weir was measured by a hook gage reading to 1-1000 of a foot. The water entering the weir box was quieted by straining through about 3 ft. of brush and a screen of clapboards.

The circuit to the motor running the power pumps was broken, and an ammeter inserted, upon which readings were taken and the power required for feeding the boilers obtained.

The shunt field circuit of first one and then the other of the generators was connected through an ammeter and the current required for the fields was thus obtained. A standard voltmeter was connected to the circuit, and check readings obtained upon the station voltmeter.

During the night, in order to obtain a load for one engine after the load on the outside lines became too light, a large water rheostat was provided and connected to No. 3 generator on the

### ENGINE SIZES.

Main engines No. 2 and No. 3.  
Diameter high, 28". Diameter rod, 5¼".  
Diameter low, 56". Diameter rod, 6¼".  
Stroke, 5 feet.

AIR PUMP. SIZES NO. 2 AND NO. 3.	
Diameter steam cylinder . . . . .	16"
Diameter piston rod . . . . .	2½"
Stroke . . . . .	12"
Diameter bucket . . . . .	36"

### BOILER SIZES.

(4) B. and W. Boilers.	
Heating surface (outside) one boiler . . . . .	5340 sq. ft.
Grate surface, one boiler . . . . .	84 sq. ft.
Total heating surface . . . . .	21,360 sq. ft.
Total grate surface . . . . .	336 sq. ft.

### WEIR.

Weir 3 feet long without end contractions.  
Crest of weir above floor of pit was 1.6 feet.  
Calculate by formula of Feley & Stearns.  
 $Q = 3.31 L H^{3/2} + .007 L$  first approximation.  
Correct for velocity of approach, using for H (the height by hook gage +  $\frac{1.5v^2}{2g}$ ).  
 $v$  = velocity of approach.  
 $L$  = length of weir.  
 $Q$  = cubic feet per second.  
 $g$  = 32.2 feet.

### BOILER TEST.

Duration of test . . . . .	45 hours.
Kind of coal . . . . .	New River.
Boilers B. & W. with extended furnaces (2) batteries of two.	
Total heating surface of the four boilers . . . . .	21,360 sq. ft.
Total grate surface of the four boilers . . . . .	336 sq. ft.
Average absolute boiler pressure at boilers . . . . .	168.4 lbs.
Average quality of steam (at boilers) from both batteries (dry steam = 1), . . . . .	.989
Total weight of coal as fired from barrows . . . . .	159,116 lbs.
Total weight of dry coal (1 per cent. of moisture) . . . . .	157,525 lbs.
Total weight of ashes and clinkers . . . . .	9,342 lbs.
Total combustible burned . . . . .	148,183 lbs.
Dry coal burned per square foot of grate per hour . . . . .	10.42 lbs.
Total water weighed in barrels . . . . .	1,490,621 lbs.
Total returns from separator drips . . . . .	7,568 lbs.
Total feed water supplied to boilers . . . . .	1,498,189 lbs.
Average temperature of feed water entering boilers . . . . .	209.1° F.
Average temperature of feed water entering economizer . . . . .	52.7° C. 126.86° F.
Average temperature of feed water leaving economizer . . . . .	98.5° C. 209.3° F.
Equivalent evap. from and at 212° per pound dry coal (boilers and economizer) . . . . .	10.68 lbs.
Total B. T. U. taken up by boiler and economizer per pound of dry coal . . . . .	10,311 B. T. U.
Heat taken up by water in economizer per pound of dry coal . . . . .	786.4 B. T. U.
Heat gained in economizer in per cent. total heat acquired . . . . .	7.62
Ash and clinkers in per cent. of total dry coal . . . . .	5.9



first night, and to No. 2 generator on the second night, and a steady load of about the nominal capacity of the machine carried, the other engine being shut down.

A standard shunt and a portable ammeter were connected in this circuit and used when the rheostat was in circuit. Electrical readings upon all instruments were taken every five minutes, every third reading being taken upon the stroke of a gong.

The test on the boilers was continuous for 45 hours. The con-

dition of the fires was noted at the beginning of the run, and the fires were brought to the same condition at the end.

If all the possible errors of the test on the boilers are assumed to be cumulative, the maximum error possible is 1.5 per cent. The tests on the engines and generators were divided up into five parts.

From 1:15 p. m., May 10, to 11:30 p. m. Engines No. 2 and No. 3 on regular station load.

## RESULTS OF TESTS OF ENGINES, HARVARD POWER STATION.

Time of run . . . . .	MAY 10, 1-15 P. M. TO 11-30 P. M.			MAY 11, 6-30 A. M. TO 11-30 P. M.			MAY 12, 12-45 A. M. TO 5-45 P. M.			MAY 12, 6-30 A. M. TO 10-15 A. M.		
	No. 2.	Pump No. 2.	Pump No. 3.	No. 2.	Pump No. 2.	Pump No. 3.	No. 2.	Pump No. 2.	Pump No. 3.	No. 2.	Pump No. 2.	Pump No. 3.
Revolutions per minute during run . . . . .	71,974	54,254	72,252	71,967	50,450	70,828	71,703	56,957	71,635	72,195	58,682	72,195
Average per cent. of cutoff on high pressure cylinder . . . . .	23.6	18.4	23.6	33.1	42.4	23.43	36.1	20.60	19.0	20.2	20.2	20.2
Mean effective pressure on . . . . .	58.9	32.1	37.7	67.8	42.4	61.7	81.1	38.4	56.7	45.1	19.0	45.1
{ H. C. . . . .	54.9	10.4	43.8	68.4	3.7	58.8	74.9	13.7	54.6	14.0	14.0	47.5
{ L. H. . . . .	8.73	10.9	4.8	13.2	8.7	11.8	11.7	11.0	8.20	11.0	8.20	11.0
{ L. C. . . . .	12.0	9.32	9.32	12.6	10.5	10.40	11.5	10.5	8.96	11.0	8.96	9.70
Horse power by indicator on . . . . .	395.51	10.61	11.81	455.21	13.02	407.71	542.52	13.33	378.93	6.82	303.77	9.64
{ H. C. . . . .	354.42	3.34	283.35	444.53	.98	373.55	481.71	4.62	350.82	4.89	307.59	2.67
{ L. H. . . . .	234.48	293.93	317.38	354.51	247.40	271.19	311.59	296.36	219.21	296.36	296.36	296.36
{ L. C. . . . .	317.97	201.22	278.69	333.84	278.69	271.19	311.59	296.36	219.21	296.36	296.36	296.36
I. H. P. of Each Engine . . . . .	1302.4	13.95	1155.8	1585	14.0	1299.8	1648.8	17.95	1195.3	11.72	1105.5	12.31
Total I. H. P. Both Engines . . . . .	2458.2					2536.4			2389.8			
Total water supplied to boilers during run . . . . .	366,824			120,575			130,050		133,741			
Total steam used by three calorimeters during run . . . . .	12,761			6,225			6,925		8,072			
Steam per Hour per I. H. P. of Main Engines . . . . .	34.93			114.13			14.15		129,672			14.64
Temperature of feed water { Entering heater on exhaust of . . . . .	50.8			50.1			50.9		52.0			52.0
{ Leaving heater on exhaust of . . . . .	132.1			160.1			133.3		133.5			133.5
B. T. U. per I. H. P. of Main Engines per Minute . . . . .	253			254			254		260			263
Coal per I. H. P. of Main Engines per Hour . . . . .	1.47			1.47			1.48		1.56			1.53
Temperature of condensing water { Cold °C. . . . .	13.1			10.6			13.3		11.8			13.1
{ Hot °C. . . . .	29.2			30.0			30.8		29.2			32.2
Weight of drip trapped from working side of receivers . . . . .	20,600			7,580			42,160		7,170			8,830
Quality of steam at throttle. (Dry steam = 1) . . . . .	140.0			150.5			140.0		151.3			150.4
Pressure at throttle by gauge at board . . . . .	5.0			10.4			2.8		2.1			10.1
Vacuum in condenser. (Lbs.) . . . . .	13.2			10.2			13.0		12.9			11.8
Barometer. (Inches of mercury) . . . . .	30"			30			30		30			30
<i>Draught Pressures and Flue Temperatures.</i>												
Average temperature of gases { Entering economizer °C. . . . .	216.2			225.8			217.7		236.3			236.3
{ Leaving economizer °C. . . . .	123.0			127.6			126.8		126.3			126.3
Temperature of gases leaving economizer { Maximum °C. . . . .	129.0			133.0			134.0		129.0			129.0
{ Minimum °C. . . . .	111.0			117.0			117.0		124.0			124.0
Av. draught pressure in ins. of water { Entrance to economizer, . . . . .	.5514			.4175			.6723		.6894			.4090
{ Leaving economizer, . . . . .	.4026			.2902			.3032		.3176			.3095
Draught leaving economizer { Maximum . . . . .	.844			.374			.418		.448			.246
{ Minimum . . . . .	.266			.368			.288		.298			.246
<i>From Weir Measurements.</i>												
Average height of water on weir. (Feet.) . . . . .	533			459			515		451			454
Average temperature of water weir °C. . . . .	31.2			32.0			30.4		30.4			30.3
Pounds of water over weir per hour . . . . .	888,150			798,821			893,429		691,108			696,555
Pounds of steam condensed per hour . . . . .	34,642			22,870			35,803		24,948			34,418
Condensing Water per Pound of Steam . . . . .	24.7			30.0			23.9		26.7			19.3
Condensing Water per Hour per I. H. P. of Main Engines . . . . .	344.			432.			338.		404.			281
Electrical H. P. Output Each Engine . . . . .	1156			1409			1194		1499			1083
Electrical H. P. Output Both Engines . . . . .	2267			1409			2286		1499			2087
Efficiency per cent. Ratio of electrical to steam H. P. . . . .	89.8			88.8			90.1		90.0			89.2
Coal per Electrical H. P. Output. (Per hour.) . . . . .	1.64			1.66			1.64		1.72			1.72
Electrical H. P. to run feed pumps . . . . .	15.0			13.4			15.3		14.7			14.5

From 12:45 a. m., May 11, to 5:45. Engine No. 3 alone on water rheostat with constant load.

From 6:30 a. m., May 11, to 11:30 p. m. Engine No. 2 and No. 3 on station load.

From 12:45 a. m., May 12, to 5:45. Engine No. 2 alone with constant load by water rheostat.

From 6:30 a. m., May 12, to 10:15 a. m. Engine No. 2 and No. 3 on station load.

The air pumps exhaust into the receivers between the high and low cylinders. During the first run No. 2 air pump exhausted into the condenser till 2:45, when the exhaust was turned into the receiver.

During the last run the exhaust of No. 3 pump was turned into the condenser at 8 a. m.

At the end of each run the levels in the boilers were noted, and if different from those at the beginning of the run, corrections were made for the difference.

The B. T. U. per horse power per minute of main engines was calculated by multiplying the steam per h. p. per minute by the heat in a pound of steam, of condition as determined by a calorimeter at the throttle, above the heat of the feed water leaving the heater on the exhaust pipe.

The coal per indicated horse power per hour of main engines was calculated by dividing the B. T. U. per horse power per hour by the B. T. U. taken up from a pound of dry coal. The probable error of work depending on the indicator may be assumed to be about 2 per cent.

The data and results of the tests are summarized in the accompanying tables.

### TILE CONDUIT FOR NIAGARA FALLS POWER COMPANY.

There has just been laid on the lands of the Niagara Falls Power Company at Niagara Falls a new vitrified tile cable conduit. This conduit has 36 ducts, each  $3\frac{1}{2}$  in. in diameter. It extends from the end of the conduit originally laid by the com-

hole, are run No. 8 wires to facilitate laying the cables. The contractor was R. D. Young, of Niagara Falls.

The use of tile in the construction of this conduit is but another evidence of the favor tile is winning for electrical conduit work. The first conduit built by the Niagara Falls Power Company is made of concrete, and extends from the power station to the Pittsburg Reduction Company's plant. It is of sufficient size to allow a man to pass from end to end, the power cables being hung on brackets at the sides. As there is but little reason for disturbing power cables when once laid, it is evident the new conduit will be fully as valuable and serviceable as the old one, while probably much cheaper.

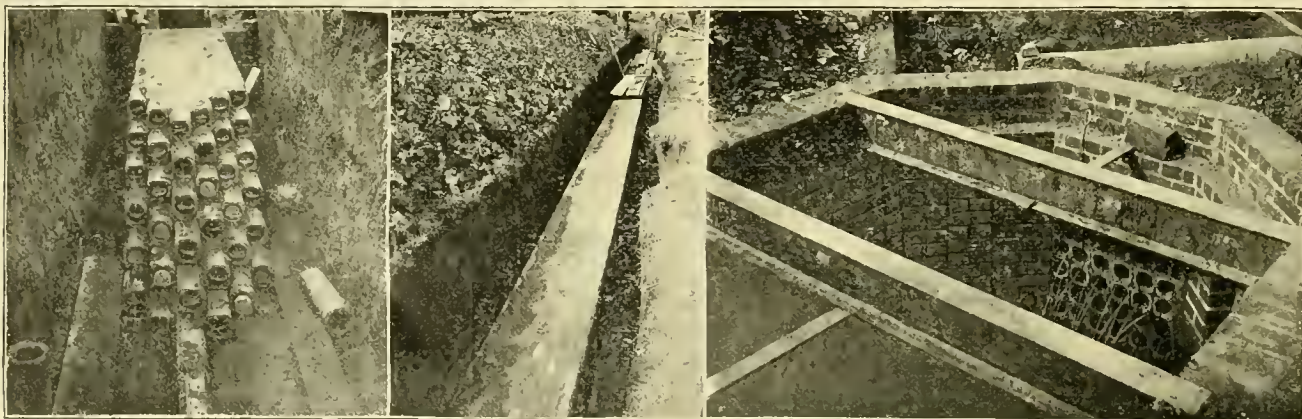
### ELECTRIC TRACTION.

At the tenth general convention of the Permanent International Tramway Union held at Geneva in August, last, E. A. Ziffer, engineer and president of the council of administration of the railway of the district of Bukovine, Vienna, presented two reports, one upon the recent progress of the various systems of mechanical traction for tramways, an abstract of which was published in the REVIEW for October, and one upon the advantages and inconveniences of the different modes of electric traction, the general conclusions of which are here abstracted.

The different modes of electric traction at the present time are:

1. By accumulators.
2. By an aerial conductor or conductors, the different systems being distinguished by the method of taking the current.
3. By an underground conduit.
4. By mixed systems, or combinations of overhead lines with accumulators or underground conduits.
5. By closed conduits or contact systems.
6. By third rails.
7. By polyphase currents.
8. By single phase alternating currents.

The author discusses each of these systems at greater or less length. Our readers will probably be most interested in his remarks upon the alternating current systems, which follow:



TILE CONDUIT OF NIAGARA FALLS POWER COMPANY.

pany eastward to the Union Carbide Company's plant. The trench was excavated to a depth of about 5 ft., and the space occupied by the conduit tile is 2 ft. 5 in. The tile are bedded in cement, while the sheeting on the bottom and top is 4 in. and on the sides 2 in. All joints are half broken. The tile used are the product of the H. B. Camp Company. About every third tile the mandrels were pulled, assuring a smooth, clean interior.

At intervals along the conduit manholes are located. These have a depth of 8 ft., are octagonal in form, and are built of brick. Across the top of each manhole have been placed two iron girders, intended to support the arched covering to be built. Brick piers in the manholes are for the purpose of carrying brackets to support the power cables in their passage through the manholes. The total length of the section of conduit just built is 1,230 ft., and through the ducts, from manhole to man-

This remarkable system (three-phase), installed by Brown, Boveri & Co., at Lugano, has demonstrated in a brilliant manner the possibility of employing three-phase currents for electric traction and the numerous advantages which follow from its use; the success of this installation makes inevitable the rapid development of a mode of traction that has had and has yet numerous opponents, but which by sole reason of its merit in all cases where the extent of the system or the distance from the generating station renders the problem of supplying continuous current difficult if not impossible of solution, strongly recommends itself.

The application of polyphase currents to railway work presents a certain superiority and certain inconveniences when compared with continuous current working.

The principal objection that can be made against the system



is that there must be at least two overhead wires. This objection is, however, when examined not so serious as it at first appears to be. In fact that which detracts most from the appearance of the street, the poles, brackets, etc., are the same as with continuous currents, while the weight of copper necessary for the two overhead wires of a two or three-phase system is but little greater than that for a single continuous current wire.

The crossings and junctions of the wires are naturally more complicated with two than with one, but they could be simplified, by using a single wire only at these points, which is permissible by reason of the fact that a polyphase motor when once in motion will continue to run on a monophasic current. By using two trolley wires, if they be properly arranged, it is nearly impossible that both trolleys leave the wires at the same time, and sparking will therefore be almost completely eliminated. As the sparking with even a single phase alternating current is less than that with continuous current, the wear on the trolley wires will be reduced to a minimum and will be very much less than with a continuous current.

The principal advantages of alternating currents for tramways are the following: They permit the supply of an extended system with but small loss in transmission, and with a small investment in transmission lines. The currents may be easily transformed, and the transformers require no care, permitting the current to be generated at high potential for economical distribution to transformers where the voltage is reduced before fed to the motors.

This does away with heavy feeders and makes the wiring for the entire system lighter. It also makes possible the utilization of water falls at a distance from the railway.

It is true that this last may be done to some extent with continuous currents but only by installing rotary converters at substations, which increase the cost of the installation and also require constant superintendence.

So far as the motors are concerned, experience shows that polyphase motors are simpler and stronger in construction, and more reliable in action. They can be easily built for high potentials, and their greatest advantage is the fact that collector rings replace the commutators of continuous current machines.

The statement often made that the starting torque of polyphase motors is not as great as with continuous current motors is absolutely incorrect; on the contrary, for equal weights, it is possible to construct motors with rotating fields having a starting torque much greater than the normal, since the magnetic density of the iron of the field is much less than in continuous current motors, and this may considerably augment the torque for a short period.

The regulation of the speed is effected by inserting resistances in the induced circuit, of which the tension may be made as low as is desired. It follows that the resistances are easier to make and less subject to deterioration than the apparatus for controlling high tension continuous currents. Alternating currents have the further advantage that the dangerous stray currents are avoided.

This method permits the variation of the speed of the motor from that which corresponds to synchronism to zero.

Ordinarily the resistances are all cut out and the motor has the advantage of having a speed approximately constant, whatever the variations in the load. Up and down grade the speed is the same. The motor itself is an automatic brake. The eddy currents in the motor due to commutation are avoided and also all danger of electrolysis due to stray currents from the return railway circuit.

The first three-phase tramway installed was that at Lugano, which has a length of three miles. The gage is 1 m. (39.37 in.); the shortest radius on curves is 50 ft. and the heaviest grade 6 per cent. The two trolley wires are 6 mm. (.236 in.) in diameter placed 25 cm. (9.84 in.) apart, and suspended from metal brackets.

There are four cars, with a capacity for 24 persons, each equipped with a 20-h. p. motor geared to one axle. The gear ratio is 1 to 4; the speed is 15 kilometers (9.37 miles) per hour. The motor is controlled from either platform of the car. The two trolleys are placed on the roof and are 1 meter apart, longitudinally.

The first trials were made in December, 1896, and the results

were satisfactory. These trials showed the grade of 6 per cent could be ascended, even with an overloaded car, without having to strengthen the field of the motor.

This installation is not merely a happy experiment in electric traction but is, we believe, an evidence of the superiority of polyphase currents as much from a technical as from an economic point of view.

Ganz & Co., of Budapest, installed a polyphase line at their works in 1897.

The success of the Lugano road has led to the adoption of the system for the Stranstadt-Engelberg, Zermatt-Gornergrat, Jungfrau, and Berthoud-Thonne lines, which have the lengths, respectively, of 13.3, 6.2, 8.8, and 25 miles.

Recently single-phase alternating current motors have been constructed which appear to satisfy the conditions of electric traction. If this should prove to be the case a simple alternating current would have an advantage over all other systems, since the current could be transmitted at high potential, and transformed to so low a voltage that one of the rails could serve to conduct the current to the car and the other one for the return. A low potential, 20 to 25 volts, should give a satisfactory result even with poorly insulated rails.

In conclusion, Mr. Ziffer says:

Electric traction has in all countries been so developed that this means of transportation has become an imperious necessity, especially in cities, and everywhere excites the greatest interest.

To weigh the comparative advantages and disadvantages of each system is a difficult task, almost impossible to accomplish, and one which is liable to cause the author to be accused of partiality. I shall confine myself to the facts confirmed by practice.

1. The question of accumulator traction it appears must soon be solved, since some makers have constructed accumulators of less weight and of longer life than those formerly on the market.

A future seems to be assured for this system because of the independence of the train units, which in case of accident prevents the entire system from being blocked. Besides it does not detract from the appearance of the streets, nor cause disturbances in the telegraph and telephone systems; there are no earth currents and the generating station may have less machinery and be operated in a more economical manner than when transmission circuits are employed.

In comparison with the trolley and conduit systems, accumulators have these disadvantages: The cars are heavier per passenger carried; the batteries rapidly deteriorate; the efficiency is low on heavy grades; the cost of maintenance is higher.

Opinions are divided as to the overhead system and the accumulator system with recharging as the tests of the latter, while pronounced satisfactory, can not be considered as conclusive.

2. The overhead trolley is most extensively used and has been longest tried in practice, the first cost is least and it assures the greatest economy of operation. This system can be very readily changed to any other that may eventually be found superior to it; it may be employed with confidence where any system of mechanical traction by adhesion is impossible; the transformation of existing horse lines for overhead electric traction is quickly made without interrupting the service; and the system is economical even for small towns where the traffic is light.

Esthetic objections to the overhead wires, the danger to other users of the street, and the electrolysis of gas and water pipes are for the most part exaggerated, and may be overcome by suitable measures.

The use of auxiliary "buffer" batteries for overhead trolley systems requires a costly installation but is advantageous in equalizing the load on the generators.

Opinions differ very much as to the superiority of the trolley wheel or the sliding contact, but the sliding contact stirrup has the advantage over the wheel of giving greater security against slipping off. On the other hand the wear of the stirrup is greater than the wheel. Other contact systems have not been as yet sufficiently tested in practice.

3. The conduit system has the advantage over the overhead trolley in that the appearance of the streets is not spoiled and that no preventive measures have to be taken in regard to telegraph and telephone wires. On the other hand the disadvan-

tages are, the great first cost, the difficulty in keeping clean and of draining the slot channel, and the difficulty of getting at the underground conductor in the event of any damage to it.

4. The mixed system with overhead conductors and accumulators combined, which is mostly adopted in order to avoid the use of overhead wires in the more fashionable quarters of the city, is continually making great headway and proving itself to be of general value. This is only advantageous when the storage batteries propel the cars over the longer portion of the route.

The combination of overhead trolley and underground conduit systems is less costly in operation than the other mixed system; it presents, however, the disadvantage that the costly conduit must be considered as a total loss if a change be made in the future, and the system has all the other disadvantages of the underground conduit. If, however, the sections with the overhead wires are long, the conduit is preferable to accumulators.

5. The closed conduit system has the advantage over the overhead trolley that it does not clash with esthetic demands, and as compared with the slot channel system, the installation is more economical; and when suitably and substantially built, it is cheaper to work. As to the disadvantages of this system, as used up to the present time, there appears to be a difficulty in keeping the channel free from moisture and dangerous accumulations of gas, and in keeping the apparatus and contacts which are in the channel continually in working order; further, there is great expense caused by maintenance of good insulation between the sectioned conductor and the rails, and the difficulty in changing the contact apparatus with the consequent uncertainty in working. Therefore, notwithstanding the undeniable advantages, the systems that have so far been practically tested cannot be said to have passed out of the experimental stages.

6. The third rail or center rail system is cheaper in its installation than any other, but can only be employed by companies possessing their own right of way; it is especially useful for elevated and underground roads. It has proven itself to be practically useful, but in consequence of leakage of current the running expense is high.

7. The polyphase system is not only a remarkable innovation in the domain of electric traction but a demonstration, from both a technical and an economical point of view, of the value of polyphase alternating currents. In connection with large lighting plants, the system would be a good one for small tramways in cities as well as for suburban and interurban lines.

8. The monophasic alternating current system is also an innovation deserving of particular attention, as the motors have all the advantages of induction motors, in their construction and regularity of operation. The application of this system is for the future, however.

## QUEBEC, MONTMORENCY & CHARLEVOIX RAILWAY.

The Quebec, Montmorency & Charlevoix Railway has recently invited applications for an issue of \$1,500,000 of 25-year, 5 per cent gold bonds, to be secured by a mortgage on the entire property of the company.

The company owns and operates the electric railway system of the city of Quebec. It also runs from the city of Quebec past Montmorency Falls and Ste. Anne de Beaupre to Cap Tourmente, a distance of about 30 miles, which is at present operated by steam. It is intended to electrify this road throughout, and also to construct an independent branch along or near the highway to Montmorency Falls, the whole to be run in connection with the electric railway system of the city of Quebec. The estimated cost of these improvements is \$330,000, and out of the proceeds of the present issue this sum, or its equivalent in bonds, will remain in the hands of the trustees to be expended for such work as it progresses. When completed the system will comprise over 60 miles of well equipped electric railway.

For the last three months the gross earnings of the system were over \$79,000 and the operating expenses less than \$34,000. After deducting one-fourth of the cost of removing snow in the winter, which is estimated at \$12,000, the net revenue for the three months was over \$42,000.

E. A. Evans, general manager of the consolidated system, estimates that when the road is completed the surplus, after paying interest on the bonds, will be \$148,900. Having had the management of the Quebec District Railway, Mr. Evans is well qualified to judge of the prospects of the extended system.

Ahearn & Soper, of Ottawa, examined the property and their report contains the following passage:

"We have an intimate personal knowledge of the character of the construction and equipment of the Quebec District Railway, and consider it unexcelled by any electric railway on this continent. The roadbed, rails, overhead electrical construction, cars, trucks and motors are all of the latest and best type. Owing to the railway's exceptional equipment, repairs will be very inexpensive. This fact, together with the operation of the road by water power, and the excellent management which characterizes the company, render the property one that can be operated with great economy, while the peculiar topographical features of Quebec make the use of the cars almost a necessity and ensure an increasing revenue. In conclusion, we beg to say that we consider the estimate of Mr. Evans fair and conservative. In our opinion the figures given by him for the probable earnings of the steam railway transformed to electricity and the electric railway on the highway between Quebec and Montmorency are somewhat lower than the actual results will prove."

## TERRE HAUTE RECEIVER'S REPORT.

Joshua Jump, receiver of the Terre Haute Electric Railway, appointed October 18, 1897, last month filed a report of the receipts and disbursements for the year. He states that when appointed the company was indebted to its employes for \$1,830.12 and had \$48.74 on hand; other general indebtedness amounted to \$1,179,557.58 of the bonds pledged as collateral security could be sold for the amount for which they were pledged, and as the bonds sold since have not realized that sum, the indebtedness of the company has proved to be in excess of the sum stated.

The receipts for the year were:

From passengers .....	\$ 98,904.31
From sundry .....	1,526.74
From light installations .....	2,381.04
From city of Terre Haute for light .....	24,740.59
From commercial arc lights .....	6,328.41
From incandescent lights .....	13,645.00
From power .....	4,397.62
From steam heat .....	259.68
From steam heat installations .....	240.05
<b>Total .....</b>	<b>\$154,804.15</b>
Disbursements .....	140,619.26

Balance .....

\$ 14,184.89

Receiver's certificates to the amount of over \$33,000 were issued to pay pressing debts, including city taxes and penalties; permission to apply \$10,000 of the balance now on hand to redeeming these certificates is asked.

The receiver states that the company's lighting contract with the city has been a constant source of loss from the start, and a great burden to the company.

## ACCIDENT AT WASHINGTON, D. C.

November 28, a car on the Georgetown & Tenleytown Railway got beyond control of the motorman while descending from M street to the river on 32nd street hill, the Georgetown terminus of the line, and jumping the track at a curve at the foot of the hill struck a boat house on the river bank. A number of boats, oars, and the boat house were damaged; the car was but little injured. The motorman remained on the car and escaped all injury; there were no passengers.

Among recent patents is a new guard rail for open cars. Short bars are pivoted to alternate posts and are raised and lowered by means of rods attached to cranks on a rod at the top of the car.



## THE CONSTRUCTION OF SURFACE RAILROAD TRACKS IN PAVED STREETS.

Abstracted from the report of the Committee on Street Paving, N. P. Lewis, Edw. B. Guthrie and Geo. N. Ames, presented at the meeting of the American Society of Municipal Improvements.

The committee appreciated the fact that the subject of laying and maintaining pavements had been thoroughly discussed on previous occasions, and as it was not directed by the last convention to submit a report upon any particular subject it was considered wise to try and present some new phases of the paving problem.

In the early part of last summer a circular letter was addressed to members of the society in all of the cities represented, asking for papers upon the following subjects:

1st. The selection of paving material—that is, what material is best suited for certain conditions, taking into consideration first cost, economy of maintenance, ease of traction, durability, sanitation, etc. This problem will naturally have different solutions in different localities, and, under varying kinds of traffic, but a careful consideration of the special qualities of different paving materials should result in conclusions which will be of value and interest to the society

and between the rails are proper and most important subjects for its consideration.

Early in August a circular letter was addressed to the officers of 28 of the most important street railroad companies in the United States. This letter requested answers to the following questions:

What is your standard rail section? Is it a side-bearing, grooved or T-rail, and is the form prescribed by the municipal officers? Is there any reasonable objection to the use of a grooved rail, and are you permitted to use a T-rail in any paved street?

Does your company lay and maintain the pavement between the tracks?

On asphalt streets is the pavement carried up to the rail on either or both sides, and, if so, do you find it difficult to maintain such pavement?

Do you favor the use of a T-rail in paved streets, and do you think that stone and asphalt pavement can be maintained along such rail?

Your committee wished to ascertain the views of the officers of important companies, known to be well-managed, and to see whether or not they were disposed to attach proper importance to this question of paving in connection with their tracks. The information asked for has been received from 17 of the companies, and the general character of their answers will be seen

TABLE SHOWING RAIL SECTIONS FAVORED BY STREET RAILWAY OFFICIALS AND THEIR OPINIONS AS TO KIND OF PAVING MOST SUCCESSFUL ALONG TRACKS.

Railroad Company.	Rail in general use.	Height, Weigt.	Paving along rails on asphalted streets.	Can asphalt be successfully maintained along rails?	Objections to grooved rails	Is T-rail favored in paved streets, if permitted?
Albany Railway	Side bearing girder	9 in. 90 lbs.	Formerly granite toothings	Yes.	Snow and ice fill grooves.	Yes
Blaghamton Railroad Co.	Grooved	9 in. John-son.	Asphalt now carried to rails for last two years	Yes.	None.	No experience
Brooklyn Heights Railroad Co.	Side bearing girder and grooved.	9 in. 90 lbs.	Asphalt along rails and stone toothings.	On outside, not on inside.	Not from dirt, but it is more difficult to maintain pavement than with side-bearing rail	Yes, if permitted by city officials
Buffalo Railway Co.	Semi-grooved.	9 in. 94 lbs	Stone toothings.	No.	Snow, ice and dirt would raise great trouble with full-grooved rail	Would probably be successful, but not permitted.
Cincinnati Street Railway Co.	Grooved, on cross ties set in concrete	6 in. 72 lbs.	Asphalt along rails both sides	Yes.	None.	Not better than grooved rail now in use
Denver Consolidated Traction Co.	Top, with cross-ties on concrete	6 in. 72 lbs.	Stone toothings	No.	No experience. Too much preferred.	Yes. Under local conditions, gauge 3 1/2 ft. and street wide.
Detroit Citizens' Street Railway Co.	Grooved, laid in concrete	John-son. 96-285	Asphalt outside, brick between rails	On outside, not on inside.	None	Not better than section used and difficult to maintain pavement.
Lincoln Traction Co.	Top	6 in. 62 lbs	Vitrified brick in all cases.	No asphalt facility.	No experience.	Yes.
Market Street Railway Co., San Francisco, Cal.	Side bearing girder and top	Not given.	Stone toothings	No.	Dirt makes rough riding along rails	Yes, with good, tough stone pavement.
Metropolitan Traction Co., New York	Grooved girder.	9 in. 106 1/4	Asphalt along rails and stone toothings.	Yes, but repairs frequently required.	None, except difficulty in maintaining pavement.	Not permitted.
Nassau Railroad Co., Brooklyn	Side bearing girder	9 in. 90 lbs	Asphalt along rails and stone toothings	Only with difficulty	Impossible to keep track clean, except with asphalt pavement.	Yes.
Washington, D. C.	Grooved.	9 in. 90 lbs.	Asphalt along rails both sides.	Yes.	None.	Neither stone nor asphalt can be maintained along them.
New Orleans Traction Co.	Side bearing girder.	John-son. 90-295	Stone toothings	No.	Dirt in grooves requires more power and makes rough riding of tracks.	Yes, on streets wide enough as accommodate vehicle outside of tracks.
Union Railroad Co., Providence, R. I.	Grooved.	9 in. 96 1/2 lbs.	Asphalt against rails.	With difficulty.	No objections stated.	Not favored nor permitted.
Toronto Railway Co.	3/4 grooved.	6 1/2 in. 73 lbs	Stone toothings.	Asphalt against rail in some cases.	None.	Neither stone nor asphalt can be maintained along them.
Twin City Rapid Transit Co., Minneapolis and St. Paul.	Top, laid on concrete—no cross ties	7 in. 90 lbs.	Asphalt gird, but abandoned for stone toothings.	No.	Many objections, but not stated	Not permitted.
Union Traction Co., Philadelphia	Side bearing girder	9 in.	Stone blocks both sides of rail.	No.	Decided objections on account of difficulty in keeping clean.	No, except with very light traffic and brick pavement.
West End Railway Co., Boston, Mass.	Side bearing girder, some grooved	9 in. 90 lbs.	Stone toothings against rails in some cases.	Asphalt. Only with great difficulty.	Object to use, reasons not given, but obliged to use in some cases	Favored, except for difficulty in maintaining any pavement.

2d. Railroad track construction in paved streets: the character of foundation, form of rail and kind of pavement best adapted for use in connection with tracks, having in view permanency of structure, with least possible disturbance of the surface for repairs, and a minimum of obstruction to the use of the street by vehicles

3d. The obligations of street railroads and other corporations as to maintenance of pavements between their tracks, or over their sub-surface construction. Would not more satisfactory results be obtained if railroad companies were to pay a fixed sum per mile of track per annum to the city, and the latter assume all responsibility for repairs and renewals?

4th. Regulations to restrict and control the opening of pavements by corporations, plumbers and others.

It was explained that the committee did not wish to obtain descriptions of methods followed in various cities, unless these methods had special merit to recommend them, but was anxious to secure information which could not be obtained elsewhere, and which would be of real value to the members of the society.

While a number of responses were received to this circular they nearly all stated that it would be impossible for the writers to prepare a paper

The committee felt that there was no subject at the present time of more vital interest to municipal officers than the effect of street railway track upon pavements, and it has ventured to make this the subject of special investigation and report.

The question of compensation for franchises, the quality of service given the public, etc., are not the subjects which properly concern your committee; but the method of track construction, the section of rail used, and the kind of pavement laid along

from the accompanying tabular statement. The spirit of fairness manifested by the replies is gratifying, and indicates that the companies as well as municipal officers, are devoting much attention to the problem of paving that part of the street used by them. The fact is becoming appreciated that, as stated by the general manager of the New Orleans Traction Company.

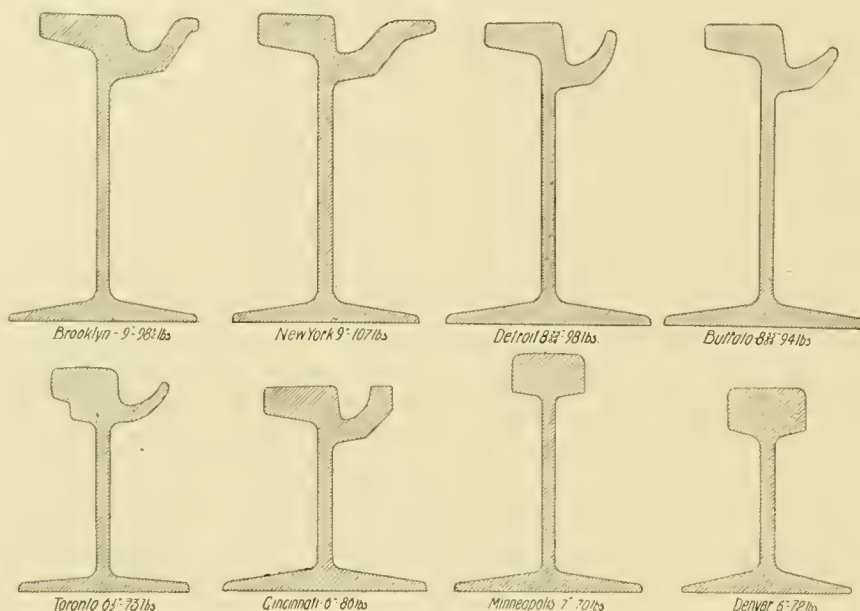
"In the construction of tracks in paved streets the pavement forms a large proportion of the expense, amounting in many instances to as much or more than the track construction proper, and as the stability of each depends largely upon that of the other, only the best material and methods in track and paving construction should be used, and that each should be laid without respect to expense, in the best possible manner, when will surely be the cheapest in the end."

Repairs to track in paved streets are necessarily expensive, and every effort is now being made to build as substantially as possible. The laying of heavy rails upon a foundation of concrete, dispensing altogether with wooden cross-ties, is no longer an experiment, having been especially successful in Detroit, Denver, Minneapolis, St. Paul and Toronto. The methods of construction in Cincinnati, Detroit, Denver, Minneapolis and Washington (the last for lines operated by sub-surface electric power) are shown by the accompanying sections. As to the form of rail, there is considerable variation, and difference of opinion, though that most in favor among railway companies is the 9-in. side-bearing girder weighing 90 lbs. or more to the yard, though in several places where permitted by the law or the municipal authorities the T-rail seems to be in favor, while municipal officers generally prefer a grooved rail. Considerable opposition has been manifested by the railway companies to the grooved rail, but

when its use has been insisted upon, they have soon accepted the situation, and find that there is no difficulty connected with its use. One railway official writes:

"We do not use any grooved rails for the reason that they are

Your committee is disposed to agree with the sentiment that asphalt and street railroad tracks are hereditary enemies, but is convinced that with substantial track construction, and the proper kind of rail an asphalt pavement can be maintained on both



FORM OF STREET CAR RAIL USED IN DIFFERENT CITIES.

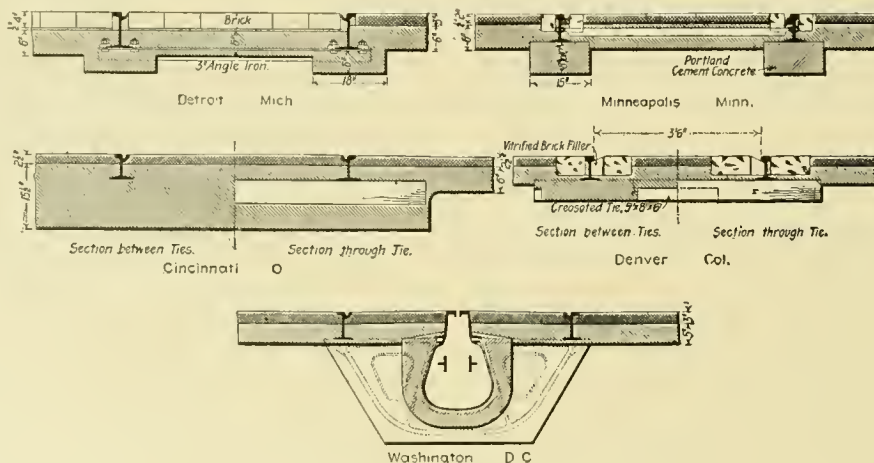
very poorly adapted to the street car business. \* \* In fact, I know of no reason for the use of grooved rails anywhere, except that it is a fad of certain theorists who have no practical knowledge of the business, which, like other fads of the kind, such for instance as the narrow gage for railways, must have its little day of popularity among the ignorant and inexperienced, to be finally cast aside as soon as the public have had experience enough with it to know what it really is."

The T-rail would be deservedly popular were it not for the difficulty of maintaining pavement of any kind alongside of it, though in Minneapolis, St. Paul and Denver it is claimed that

sides of the rail where the traffic is light; and that with the use of a toothed course along the inside of the rail where the traffic is heavy asphalt can be used on railroad streets as well as any other material.

After a careful consideration of the facts and opinions elicited by the letters received in response to their inquiries, and such personal investigations as have been made, your committee would report the following conclusions:

Only the most substantial and permanent track construction should be permitted in important paved streets. The tracks should be laid upon a concrete foundation, metal cross-ties being



TRACK CONSTRUCTION IN PAVED STREETS.

this can be successfully done. The question of pavement alongside of the rails (especially inside) in asphalted streets is difficult of solution. One of our replies says:

"It has been my experience in connection with railroads in different cities, that asphalt and street railroad tracks are hereditary enemies, and that brick or stone between the rails and the tracks for a foot outside is a much better kind of pavement than asphalt."

substituted for wood, resulting not only in greater permanency, but saving depth of concrete and excavation

The best form of rail is the grooved girder, 9 in. in depth, where streets are paved with stone, and 7 in. deep where paved with asphalt. In some cases where streets are very narrow, and vehicles are obliged to follow the tracks, the 9-in. side-bearing-girder may be preferably selected, stone blocks of granite or trap being laid along the inside of each rail, and at the same level



as the head of the rail. On exceptionally wide streets, where the traffic is not heavy, and will occasionally cross the tracks obliquely, but not follow them, T-rails may safely be used.

The pavement along the rails will depend upon that used on the remainder of the street. If the latter is of stone blocks the pavement along and between rails should be the same, but in all cases should be of selected blocks upon a substantial concrete foundation, the joints filled with fine gravel and paving pitch. If of brick the same practice should be followed, the joints along and between rails being filled with similar paving pitch in whatever way the joints on the remainder of the street may be treated.

On asphalted streets the asphalt may safely be carried up to the back of the rail, and if full-grooved rails are used, and the vehicular traffic is light, it may be carried entirely across the roadway. For heavy traffic the spaces between the rails and tracks should be paved with selected granite or other hard, tough blocks, laid on concrete with pitch and gravel joints. For moderate traffic a toothing course of carefully selected blocks, 4 in. wide and varying in length about 3 in., but in no case more than 10 in. long, should be laid along the inner side of the rails, whether grooved or side-bearing. These blocks may be laid in pairs of two long and two short, in which case the asphalt along them can be tamped more thoroughly.

In all cases blocks next to the rail should be bedded in rich cement mortar, rather than laid upon a sand cushion. The spaces under the head of the rail should be filled with fine cement concrete, leaving a vertical joint between this filler and the pavement, whether the latter be stone, brick or asphalt.

Openings made for repairs to track should be immediately restored before the stone blocks become injured, or the adjacent pavement or foundation disturbed. Such openings being shallow, this can always be done without danger of settlement.

## TEST OF A PECKHAM TRUCK.

November 21, the Peckham Truck Company made a test of one of its extra strong 14-A trucks similar to the ones it is supplying to the South Side Elevated Railroad Company, of Chicago. This truck is shown in the accompanying illustration. The pedestals and all other castings, with the exception of the side bearings and center plates, are of malleable iron. Helical springs are placed between the pedestals and the oil boxes. The side pieces are formed of four bars of flat iron riveted to the pedestals and placed in pairs to take the compression and tensile stresses imposed by the load. The upper bars are of steel, 3½ in. by ¾ in., and the lower ones 3½ in. by 1 in. At the center is riveted a malleable casting so the deflection in both pairs of bars is the same. There

is obtained. The bolster consists of two channels 8 in. by 2¼ in. by ¾ in., with a top plate 6 in. by ¾ in.; it rests upon the spring plank through the intervention of helical springs at the ends and a semi-elliptic spring in the center.

The cantilever portion is formed of bars of the same size and braced by a malleable iron strut. The brake rigging is hung from the bars, which are carried across the ends of the truck.

This truck is of the same design as the No. 14-A, differing from it only in the size of the parts, which in the extra strong truck are proportioned to carry a heavier load. The proportions had been carefully figured out to carry a load of 30,000 pounds on each truck with a factor of safety of six. It was considered desirable, however, that the figures should be checked by actual test, and in order that there might be no question as to its accuracy and fairness, arrangements were made with the Robt. W. Hunt & Co. bureau of inspection, of Chicago, to make the test. J. C. McMynn conducted the test.

Hunt & Co. submitted the following report:

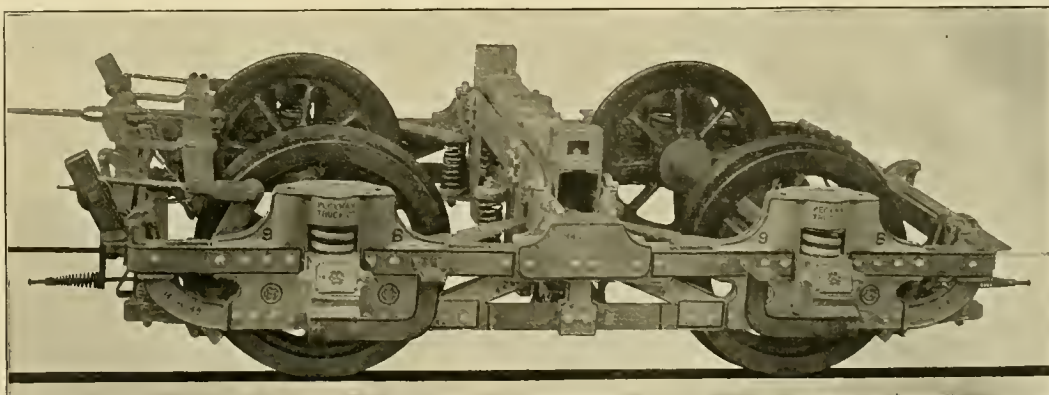
"The side frames were placed in a horizontal position opposite each other in a wheel press, and braced apart at the spring seat with blocks of wood and iron. The load was applied at the center on the bars which supported the transoms, by means of the ram of the wheel press, and readings of deflection were taken at the center and at either end, in order to correct the deflection or lost motion in the wooden supports. Observations were also taken at the various points in the truck in order to note any movement of the different members.

"The following are the deflections corrected for the compression of the wooden blocks, and represent the deflection and permanent set in one frame:

Load, Tons.	Total Deflection, In.	Permanent Set, In.
5	.00	.00
10	.00	.00
15	.02	.00
20	.03	.00
25	.04	.00
30	.07	.03
35	.16	.10
40	.19	.13
45	.26	.17

"At 50½ tons the lower tension members broke through the first rivet hole and the malleable casting at one end. Fracture of steel bar showed crystalline.

"No distortion or movement of the various members was noted except in the lower tension member, which, at a load of 45 tons, showed an elongation of .12 in. between the rivets in the connecting malleable castings."



PECKHAM'S 14-A TRUCK FOR SOUTH SIDE ELEVATED, CHICAGO.

are also diagonal braces as shown. The transom bars are of steel 5½ in. by 1 in., riveted to the castings at the center of the side pieces and held square by diagonals from the upper side bars. A spring support of steel 4½ in. by 1 in. is swung from the transoms by hangers 18 in. long, and thus an exceedingly easy motion

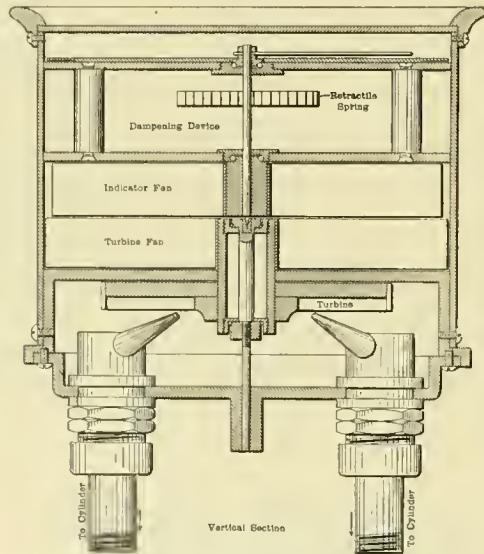
The weights on the trucks will be 20,500 pounds each; adding 50 per cent for running stresses gives 30,750 pounds, 15,375 pounds for each side frame. Rupture occurred at 101,000 pounds, so that the factor of safety is nearly 6.6, that is, 10 per cent more than allowed in the design.

# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

The absolutely necessary switchboard instruments, that is, voltmeters and ammeters, afford information as to the output of electrical machinery in the power house at any instant, and now nearly all large roads have also installed recording wattmeters which give the total output of the electrical machinery. While it is by no means necessary to have similar records as to the power developed in the engine cylinders, such records are highly desirable in order to determine the efficiency of the machinery. At the present time the output of the cylinder is usually computed from the electrical log after making tests to determine what allowance should be made for engine friction, but everyone realizes that this is only a makeshift. With a variable load, such as is found in railway power houses, the steam engine indicator of the ordinary type can give only approximate results, and in addition the labor of computing the power from the diagrams is very great if they are taken at short intervals.

There have been a number of continuous engine indicators de-



ATWOOD POWER GAGE.

signed, one of which was the invention of W. G. and C. W. G. Little, and illustrated in the REVIEW for February last. This instrument is not so well adapted for constant use but could not fail to be valuable in investigating the efficiency of engines, and in determining the power required for various machines.

A power gage especially for continuous use has been invented by G. F. Atwood and is made by the Atwood Power & Speed Gage Company, of 95 and 97 Liberty street, New York. A number of the gages have been in continuous operation on the engines of the Peoples' Electric Light & Power Company, Orange, N. J., for over 18 months and the comparisons made with indicator diagrams show a variation of less than 1 per cent.

The Atwood gage consists of a turbine driving a fan, a second fan connected with a dampering device and spring and driven by the first fan, and suitable nozzles and valves for directing jets of steam from the engine cylinders upon the turbine. Pipes run from the indicator taps in the engine cylinder to the instrument; inside the instrument the steam passages each terminate in two nozzles which point in different directions, a jet

from one tending to turn the turbine in one direction, and a jet from the other to turn the turbine in the opposite direction. Valves are placed at the point where the nozzles diverge and are moved by a reducing motion so that the steam discharge is changed from one nozzle to the other at the end of the stroke. Both ends of the cylinder are in communication with the turbine chamber all the time and by the arrangement of valves mentioned the jet from the working end of the cylinder always tends to turn the turbine in one direction, while the jet from the exhaust end of the cylinder opposes this motion. The turbine, which is a disk with thin radial blades, is light so that it will respond to the impulses but yet heavy enough to act as a fly-wheel, and maintain nearly a constant velocity for a series of uniform impulses.

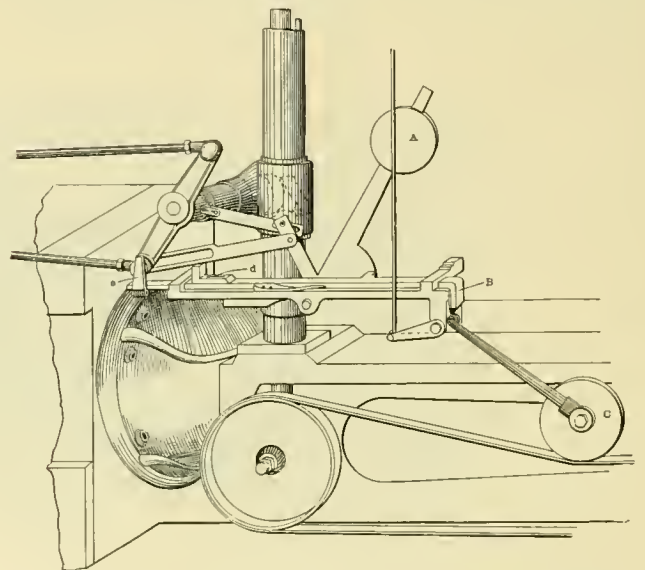
The turbine shaft is mounted in ball bearings and extends into a second chamber where a fan is keyed to it. This chamber is closed; it contains a second fan quite independent of the first, which is mounted on a shaft extending into a third chamber and connected there to a spiral spring and a dampening device; beyond this is the pointer and dial.

The turbine driven fan sets the air in the middle compartment in motion; this tends to turn the second fan against the resistance of the spring and results in turning it a distance from the normal position which is proportional to the turbine speed. The instruments are calibrated at the factory by connecting them to tanks of compressed air. The dial is generally graduated in indicated horse-power, but special conditions may make other units preferable.

\* \* \*

### An Automatic Engine Stop.

The accompanying illustration shows an automatic engine stop recently patented by J. H. Eastwood, C. E. Bibb and Frank McClintock, of Colorado Springs, Col. It is adapted for engines



AUTOMATIC ENGINE STOP.

having detachable valve gear and is shown as applied to a Corliss engine. The pivoted lever, through which the governor gives motion to the reach rods operating the "knock-off" cams, is





# Street Railway Review

## COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION.	MONTH.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.					Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel per k. w. h.	Price of Fuel per Ton of 2,000 Lbs.	Kind of Fuel	
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.							Total.
1.....	June	1,291,680	.304	.171	.037	.030	.051	.593	4.9	0.8	9.5	2.89	.....	Bituminous.
1.....	July	1,276,784	.308	.178	.036	.030	.019	.571	4.7	1.2	9.4	2.94	.....	"
1.....	Aug.	1,286,256	.303	.175	.036	.029	.029	.572	4.3	1.2	9.5	2.90	.....	"
3.....	June	208,166	.443	.275	.046	.010	.....	.774	5.0	2.02	.....	\$2.12	.....	"
3.....	July	211,029	.452	.274	.053	.010	.032	.821	7.53	4.88	.....	.....	.....	"
3.....	Aug.	200,526	.444	.285	.052	.010	.002	.793	6.35	2.6	.....	.....	.....	"
4.....	June	269,990	.370	.232	.027	.007	.014	.650	4.31	3.7	.....	3.43	.....	"
4.....	July	275,095	.390	.232	.028	.016	.011	.677	3.45	4.5	.....	3.61	.....	"
4.....	Aug.	275,455	.412	.232	.031	.010	.007	.692	3.03	4.35	.....	3.81	.....	"
5. Metropolitan Elevated, Chicago.	June	1,392,831	.326	.164	.021	.020	.021	.552	.58	2.0	6.50	3.63	.....	"
5.....	July	1,505,433	.263	.162	.020	.015	.020	.480	.62	1.7	5.03	3.03	.....	"
5.....	Aug.	1,601,165	.280	.150	.020	.020	.020	.490	.58	1.5	5.07	3.31	.....	"
8.....	June	930,064	.436	.227	.057	.....	.083	.803	.....	.....	.....	.....	.....	"
8.....	July	971,104	.529	.232	.085	.....	.083	.929	.....	.....	.....	.....	.....	"
8.....	Aug.	967,504	.586	.191	.055	.....	.095	.927	.....	.....	.....	.....	.....	"
9.....	June	280,740	.441	.347	.054	.....	*.257	1.099	.....	.....	.....	.....	.....	"
9.....	July	275,355	.455	.360	.055	.....	.047	.817	.....	.....	.....	.....	.....	"
9.....	Aug.	281,510	.456	.359	.060	.....	.046	.921	.....	.....	.....	.....	.....	"
10. Metropolitan, Kan. City, Mo. Cent. Av.	June	372,184	.293	.138	.013	.005	.011	.459	1.19	3.18	.....	4.68	.....	Bituminous.
10.....	July	338,933	.255	.133	.006	.005	.008	‡.408	1.48	3.05	.....	4.12	.....	"
10.....	Aug.	337,348	.236	.134	.012	.005	.020	‡.408	1.54	3.12	.....	3.82	.....	"

\*The company operating stations Nos. 8 and 9 has no depreciation accounts and all renewals are charged to maintenance. New appliances for use in the power house are charged to maintenance and the cost of maintenance, or repairs as it is here called, for June is high because a number of boiler cleaners purchased that month are charged to that account.

‡Miscellaneous, .002.

of fixed carbon, as determined by proximate analysis, the latter being a more or less variable quantity according to the age and degree of exposure of the coal, the remarkable result is obtained that the weathering of a sample of coal increases the percentage of fixed carbon in the combustible, and also increases by about one per cent the calorific power of the coal.

It may be noted that the English form of Dulong's formula, which neglects the term  $O \rightarrow S$ , but uses slightly lower values for the heat of combustion of C and H, would cause the calorific power, as computed, to agree more closely with the results obtained with the bomb than the formula " $146C + 620(H - O \rightarrow S) + 40S$ ." This is especially noticeable when the weathered and unweathered samples are compared.

In a general way, the results show a slight diminution of calorific power in the grades of coal examined, directly traceable to weathering. They also show that where coals have not been exposed to oxidation, by weathering or otherwise, there is a reasonably close agreement between the results calculated by Dulong's formula and those obtained with the bomb calorimeter.

Last of all, they show that when it is desired to compare the respective calorific powers of coals that have been altered to a greater or less extent by oxidation with those of coals that have not been exposed to the weather, the use of Dulong's formula, or any of its modified forms at present in use, as well as the use of Kent's curve, would lead to erroneous conclusions.

\* \* \*

The Edgewater power station of the North Chicago Street Railroad Company has been closed. It supplied current for the line to Evanston and the other branches in the extreme northern part of the city. The largest unit of this station has been removed to the California avenue power house, which now carries the load formerly on the Edgewater station. There is one rather peculiar development in this change. Some of the lines now fed from California avenue station are no less than 12 miles in length. Formerly when the Edgewater station carried a portion of this load the average consumption per car-mile, including transmission losses, was 1,000 watts from the Edgewater station and 1,050 watts from the California avenue station. Now,

with a system much more extensive, the average consumption at the California avenue station is only 1,040 watts per car-mile, with the same number of cars and the same schedule on all the lines.

\* \* \*

William Cooper, in an article on "Essential Principles of Economy in Steam-Power Installations," published in the "Engineering Magazine" for November, calls attention to an inconsistent practice in power plant design, that of making the steam piping fully duplex, while the feed-water piping is seldom duplex and often less than single. Mr. Cooper says that it is more important to make the feed-water piping duplex than to duplicate the steam pipes, because water-pipe connections are subject to shocks that the steam pipes never have to meet, as non-compressible fluids are more difficult to handle without shock than are compressible and elastic fluids. Duplex systems of feed-water piping are not advocated, but it is urged that the single pipe be extra heavy and the connections made with heavy brass elbows and tees and heavy flanged unions. A single connection, if properly made, is as reliable as any part of the equipment.

\* \* \*

What a leaky hydrant will waste in a day is probably not appreciated by those who have never taken the trouble to investigate the subject. John C. Trantwine, Jr., has made such an investigation and the results were given in a paper on "Popular Errors about Water Meters," which he presented before the Engineers' Club of Philadelphia. The waste from 12 faucets was measured and found to vary from 5 gallons to 2,357 gallons per day. This latter quantity was the flow from an ordinary service faucet left wide open; the 5 gallon loss was the result of a leak of about one drop per second. The result of such waste if at all general is that consumers who do not waste the water find their supply reduced and suffer for the sins of others.

The consumer who pays by meter suffers for his own sins, as a few leaky faucets or careless employes who leave them open will make a very marked difference in the water bill.



## LUBRICATION AND THE TESTING OF OILS.

BY G. W. BISSELL, M. E., IOWA STATE COLLEGE, AMES, IOWA.

### PART III

**Coefficient of Friction.**—The coefficient of friction between two bodies which rub on each other is defined to be the ratio between the force required to overcome the friction or resistance to motion and the pressure with which the two bodies bear against each other. Thus, if a weight of 100 lbs. rests upon a table, and there is required a force parallel to the table of 5 lbs. to keep the weight sliding on the table, the coefficient of friction is 5÷100, or 5 per cent.

In Part I of this paper it was stated that the friction which exists between two solids rubbing directly upon each other is called solid friction. The friction which exists between two bodies separated by a film of lubricant is called mediate friction. If there be complete adherence of the lubricant to the rubbing surfaces and complete separation of them by the film, the friction which is manifested is due entirely to the sliding of the particles of the lubricant on each other. This is called fluid friction and is very small in amount. In practice it is impossible to make the rubbing surfaces so true that their separation by the film of lubricant is complete, and as a result the metals come into contact with each other and at the points of contact there exist the conditions of solid friction, fluid friction existing at other points between the surfaces. Mediate friction is then, in fact, made up of two components, one being fluid friction and the other being solid friction. Experience shows that these two kinds of friction are not governed by the same laws

The generally accepted laws of solid friction are: \*

- I. The total friction decreases with increased smoothness of the rubbing surfaces.
- II. The total friction varies directly as the pressure upon the rubbing surfaces
- III. The total friction is independent of the relative velocity of the rubbing surfaces
- IV. The total friction is independent of the extent of the rubbing surfaces in contact.
- V. The total friction varies with the nature of the materials used for the rubbing surfaces

From the above and the definition of coefficient of friction there results the following law for the coefficient of friction between solids:

The coefficient of friction between solids is independent of the pressure upon, and the relative velocity of, the rubbing surfaces and of their extent, but is affected by the nature of the materials constituting the rubbing surfaces as well as the condition of those surfaces.

The laws of fluid friction are:

- I. Except at low velocities the total friction decreases with increased smoothness of the surface with which the fluid is in contact
- II. The total friction is independent of the pressure upon the fluid.
- III. The total friction increases with the relative velocity of the fluid and the surface over which it flows.
- IV. The total friction increases with the area of the surface over which the fluid flows
- V. The total friction is independent of the nature of the substance composing the surface over which the fluid flows.
- VI. The total friction varies with the viscosity and density of the fluid.

From the above and the definition of the coefficient of friction there results the following law for the coefficient of fluid friction:

The coefficient of fluid friction is independent of the nature of the material composing the surface over which the fluid flows, is

\*The tests of brake shoes made by the Master Car Builders' Association indicate that these laws are different where the friction is destructive; according to these tests the coefficient of friction varies inversely with the speed and inversely with the pressure per sq. in.; pressures above 70 lbs. per sq. in. and speeds above 30 miles per hour.

affected to a certain degree by the condition of that surface, increases with increased velocity, with the area of the surface and with the viscosity of the fluid but varies inversely with the pressure upon the fluid.

The desirability of procuring conditions in the bearings of machinery which are favorable for the existence of fluid friction only is apparent from the above considerations and from the knowledge that the coefficient of fluid friction is in all cases much lower than that of solid friction. In the table below are presented a few values of the coefficient of friction between solids which rub on each other without lubrication:

Table I. (Compiled from Kent's Handbook, p. 930, third edition.)

Surfaces, (dry)	Coefficient of Friction of Motion.
Wood on wood	.025 to 0.50
Metal on wood	.050 to 0.60
Leather on wood	.027 to 0.38
Leather on metal	.056
Metal on metal	.015 to 0.20

On specially prepared test journals lubricated with a bath of oil it is possible to obtain very low values of the coefficient of friction as exhibited in Table II.

TABLE II—COEFFICIENTS OF FRICTION OF JOURNAL WITH OIL BATH.  
Journal 4 in. in diameter, 6 in. long. Temperature 90° F.  
(Kent's Handbook, third edition, p. 932.)

LUBRICANT USED, AND VELOCITY OF RUBBING.	NOMINAL LOAD, LBS. PER SQ. IN.						
	625	520	415	310	205	153	100
	Coefficients of Friction						
Lard Oil, 157 feet per minute.....		.0009	.0012	.0014	.0020	.0027	.0042
471 " " " ".....		.0017	.0021	.0029	.0042	.0052	.0090
Mineral Grease, 157 feet per minute.....	.0010	.0014	.0016	.0022	.0034	.0038	.0076
471 " " " ".....	.0020	.0022	.0027	.0040	.0060	.0085	.0151
Sperm Oil, 157 feet per minute.....				.0015	.0011	.0016	.0019
471 " " " ".....				.0021	.0019	.0027	.0037
Rape Oil, 157 feet per minute.....	(573 lbs)	.0010	.0009	.0008	.0014	.0020	.0040
471 " " " ".....		.0015	.0016	.0016	.0024	.0040	.0070
Mineral Oil, 157 feet per minute.....	.0013	.0012	.0012	.0014	.0021		.0040
471 " " " ".....		.0018	.0020	.0024	.0035		.0070

It is found that the friction of machines of good design as to strength and stiffness of the several parts and with means of thorough lubrication of the bearings approaches more nearly the conditions of fluid than of solid friction. For example, simple steam engines have been constructed with a mechanical efficiency of 94 per cent at full load, which means that the work of friction is but 6 per cent of the available energy and that the coefficient of friction of the engine as a whole is 6 per cent. Since some of the bearings are more efficient than others the coefficient of friction of individual bearings may be less than the above figure. It should be noted also that in the case of the steam engine the total work of friction at all loads is constant, provided the speed does not vary. This is in accord with the second law of fluid friction as given above. The same is probably approximately true of other machines operated at uniform speed and with variable output.

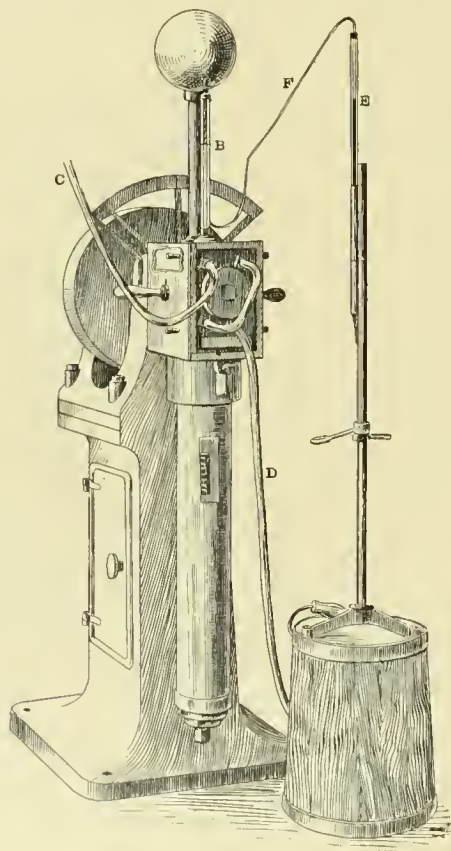
In order to secure the most favorable conditions for lubrication it is necessary to provide for bath lubrication or its equivalent by such constructions as ring or chain oiling devices. These devices are very satisfactory and permit of the continuous re-use of the oil. In large plants the oil is often pumped to the several bearings, used for lubrication, carried away by drain pipes to filters whence after being cleaned it is taken again by the pump.

#### DETERMINATION OF THE COEFFICIENT OF FRICTION OF LUBRICANTS.

Unfortunately the methods of making friction tests of oil which are in use at present are highly unsatisfactory owing partly to the

extreme care in manipulation demanded, but chiefly to the fact that the test conditions do not resemble even remotely the conditions of actual practice. Table II exhibits this very strikingly. The highest value of the coefficient presented therein is 1.51 per cent, while the average of all the values is much less than 0.25 per cent. These are less than one-tenth of values obtainable by the best machine construction. The best known oil testing machine in this country is the Thurston oil tester. Its principal features are shown by the illustration.

In the figure, B is the thermometer giving the temperature of the bearing; C and D, rubber tubes for circulating water through the bearings; E burette furnishing the supply of oil; F, siphon controlling the supply of oil. The test journal is in the form of a sleeve which slips on to the overhanging end of the main spindle of the machine which is driven by a cone pulley belted to a countershaft. The journal sleeve may be of any desired material, but is regularly made of mild steel. The bearings, of any desired metal, are made in the form of two half boxes, their bearing surfaces being accurately fitted to the journal which should itself be truly cylindrical. The boxes fit inside the housing of a pendulum and are made to press upon the journal by means of a coiled spring contained within the body of the pendulum below the boxes. This spring can be adjusted through a wide range of pressures. Sometimes the boxes are made hollow to permit of the circulating of water through them for experiments under condi-



THURSTON OIL TESTER.

tions of constant temperature. In the upper box is a receptacle for a thermometer. When the machine is in use the effect of the friction at the surface of the journal caused by the pressure and the velocity is to deflect the pendulum until its moment equals that of the friction about the axis of the journal. This deflection is registered on a graduated arc behind the pendulum over which moves a pointer attached to the pendulum. Hot water or steam can be circulated through the boxes for testing cylinder oils. Usually it is necessary to run the machine several hours to insure conditions of sufficient constancy to give reliable results. For convenience the scale of the spring is graduated to read total pressures and pounds pressure per square inch. The graduated arc reads in pounds total friction at the surface of the journal. The

coefficient of friction for a given deflection is obtained by dividing the arc reading by the total pressure on the journal.

There are many other forms of testing machines, but it is not thought worth while to describe them here, because as stated above the use of any or all of them is confined to laboratories of technical schools or large industrial plants where they can be handled by experts. The example presented serves to show the general principles and the requirements. Those interested will find more along this line in the books of which a list is given at the end of this article.

Recent experience seems to show that the testing machines will not bring out differences in mineral oils unless the pressures used in the tests are very high, much higher than for ordinary working conditions. When subjected to very high pressures the differences appear readily, the oil being in fact subjected to a kind of endurance test. The results may be expressed in the time required for a given increase in the temperature of the bearings or in the coefficient of friction or in the rise in temperature and coefficient of friction in a given time, a limited supply of oil being used.

Additional Remarks.—Owing to the existence to some extent of solid friction in all bearings, particles of the surfaces become removed by abrasion and are mixed with the oil, blackening it. The oil so blackened or dirty oil is unfit for use and should be filtered or otherwise cleaned.

Dirty oil gives a higher coefficient of friction than clean oil and also causes more heating of the bearings.

For further information on the subjects discussed in the several parts of this paper, the reader is referred to the following works wherein will be found also information as to the sources, extraction, refining and chemistry of oils and other lubricants.

Thurston: *Friction and Lost Work in Machinery and Millwork*, John Wiley & Sons, N. Y.

Carpenter: *A Text-Book of Experimental Engineering*, John Wiley & Sons, N. Y.

Redwood: *Petroleum and its Products*, J. B. Lippincott Co., Philadelphia.

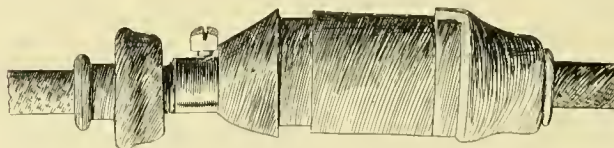
Hurst: *Lubricating Oils, Fats and Greases*, D. Van Nostrand & Co., N. Y.

Kent's *Handbook*, John Wiley & Sons, N. Y.

A 1,500-k. w. unit is being installed in the Western avenue power station of the West Chicago Street Railroad Company. The engine is being built by the Pennsylvania Iron Works and is the largest constructed by that concern for street railway purposes, and is of the cross compound, non-condensing type. The generator is of Siemens-Halske make, with an independent commutator similar to the machines installed in the Union Loop station.

## JOINT INSULATOR.

The accompanying sketch shows an ingenious device for insulating the joints of motor connections which protects the joint and at the same time leaves it easily accessible, which it certainly is not when wrapped with tape. It consists of a sleeve or jacket of gutta percha of the proper size to slip over the brass



sleeve and screws with which the wires are joined and two rubber caps with a narrow neck fitting tightly around the insulation on the wire, and a larger base which is drawn over the end of the jacket. The method of applying these joints will be readily understood from an inspection of the drawing.

The press dispatches from Wilmington, N. C., state that crowds of negro stoned the street cars during the anti-election excitement.



## THE DETROIT AUTOMATIC SWITCH.

The accompanying illustrations show the manner of installation and operation of the automatic switch made by the Detroit Automatic Switch Company, Limited, of Detroit, Mich. These switches have been in use for over six months on the lines of the Citizens' Company in Detroit and are reported by General Manager du Pont to have given the best of satisfaction in every respect.

Fig. 1 is a view at the corner of Michigan avenue and Porter street in Detroit, where the switch is used by 766 cars daily. At Woodward avenue and Congress street 1,187 regular cars use the switch; the cars of seven different divisions pass here and the novel feature of giving the majority the right of way has



FIG. 1.

been introduced, all switching being done by the branch line cars.

There are some 12 of these switches on this road and they are used by probably 10,000 cars daily. If 30 seconds be allowed for each to stop to turn a switch the time saved amounts to 85 hours per day. The saving in labor is also important, as switchmen are not now needed at these 12 points.

The insulator or solenoid section is marked 1 in Fig. 1; it is 20 in. in length and clamped to the trolley wire. At the point 2 is a small ornamental pole and box containing the switchboard and circuit controller. At 3 is a cast iron box, two sections of which are shown in Figs. 2 and 3; this contains the automatic switching device and solenoid for operating it.

The device is simple; it comprises a walking beam and bell crank lever. A pull on the crank tilts the beam and throws the

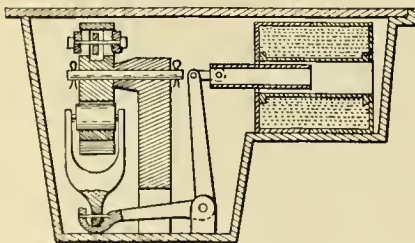


FIG. 2.

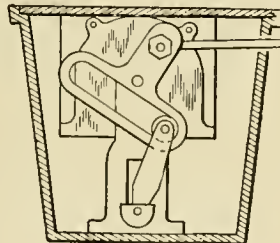


FIG. 3.

switch; upon releasing the crank it rolls to the opposite end of the walking beam and is ready for the reverse movement. The device can be attached to any existing switch point, and will not become clogged or get out of order. No sewer connections are required except where the switch point lies very low and is liable to stand under water.

The switch is operated through the controller in the car, and at all times under the absolute control of the motorman. If he

wishes to turn the switch in either direction, he simply uses power when the trolley rolls over the short insulator (Fig. 1), one point being sufficient. If he does not wish to turn the switch, he cuts off his current as he approaches the insulator, the momentum of the car carrying it over this short section—20 in. The switch may also be turned by hand at any time.

The electrical connections are made from the insulator 1, through the pole 2, through a duct under the pavement to 3 (Fig. 1).

## STRIKE AT LONDON, ONT.

The strike of the employes of the London Street Railway Company, of London, Ont., which was briefly mentioned in the REVIEW for November, page 836, has been settled. The points at issue and to secure which the strike was inaugurated were: 1. A recognition of the employes' union. 2. A recognition of a grievance committee. 3. Submission of matters in dispute to arbitration. 4. An increase in wages of 1 1-3 cents per hour.

The strikers at first were rather encouraged by the city authorities, but after a week it was realized that by so doing the city might be made responsible for damages, particularly if adequate police protection were not afforded the company, and efforts were then made on the part of the council and leading citizens to promote an amicable adjustment of the differences.

In the settlement, the first three contentions were abandoned by the men and wage question compromised by the company granting an increase of 1-3 cent per hour.

General Manager C. E. A. Carr maintained a just though firm position throughout the entire trouble, and when matters were finally settled had retained the good will of his men and the approbation of the public.

An incident following the strike was an assault made on one of the non-union conductors employed by the company; threats had been made against the man and until two days before the assault the company employed detectives to protect him. He was attacked by several ruffians as his car was making its last trip and badly cut and bruised about the head and face.

## THE ATLAS RAIL JOINTS.

Atlas supported the world on his shoulders and therefore we all see the propriety of giving his name to joints which will effectually support the rail end in railway tracks, for the former feat was not more difficult than the latter. The Atlas joint is made by connecting the rails by one or more malleable iron girders securely fastened in place; these girders are designed deep enough to have a greater resistance to bending than the rail itself, and as the bottom flange of the joint girder extends under the rail a perfect support for it is thus secured.

In practice both the suspended and tie joints have their warm advocates; the Atlas joint is equally suitable for either type. In one case joint plates are supported at the ends, in the other at the middle.

When two plates are used they are placed one on each side of the rails with lower flanges which extend under one-half the lower flanges of the rails. Bolts through the web of the rail and also through lugs on the bottom side bind the two bars together. If a single bar is used the lower flange is made wide enough to extend under the whole of the rail. At the ties the flanges are extended and supported by webs, so that they serve as rail braces also; of course the lower flanges of the joint bars act as tie plates.

When the rails are supported on chairs the bars are made deep enough so that the chairs may be dispensed with at the joints.

In the three years that these joints have been on the market the advantages which they present in being adapted to all conditions and combining rail braces, chairs, tie and bed plates with re-enforced angle bars, have led to their wide use.

The joints are made by the Atlas Railway Supply Company, of which J. G. McMichael is president and treasurer. The offices of the company are at 1654-59 Monadnock block, Chicago.

## THE PRESERVATION OF TIES.

BY W. H. GLENN.

It is the paramount idea of every general manager or superintendent when taking charge of a road, to cut down expenses and increase receipts. This idea is, of course, thoroughly commendable; but the manner of doing this and extent to which it is carried is often a question for comment. In some cases the results are highly beneficial to the road; in others, extremely detrimental. In many cases he does not stop to think that in all probability the man whom he succeeded was imbued with the same ideas, and had had his hatchet sharpened for the same items of expense. Consequently he must exercise considerable ingenuity and ability if he effects any saving.

It is natural for every manager to wish to make a favorable showing to his board of directors, and to this end his ideas of economy sometimes prove false. He cuts down his repair force (now barely adequate) and his cars go to rack. In equipping he considers only the initial cost, and much sooner than he anticipated he (or his successor) is forced to renew. This was oftener the case five or six years ago, when electric roads were comparatively new. Today probably no business interests are in better hands than the street railways. In the majority of cases we find extremely capable men at their heads.

But there seems to be one item which has not received its share of attention; or, if it has, little has been done to obviate the trouble. This is the question of ties and their preservation.

Every manager knows this to be a troublesome problem. Or if he does not, the passenger, who is almost shaken to pieces on a piece of bad track, does. And very soon a large expense account for the "Maintenance of Track" and "Renewals of Ties" tells the same story.

There seems to be no uniformity of opinion as to the best method of remedying this trouble. Different kinds of ties have been used with varying results, owing, mainly, to the locality and the conditions of the earth in which the ties are placed. Oak ties are very largely used; but their maximum life seldom exceeds eight years. In the south pine ties are the favorite; but five years is a good life for them. There have been a few isolated cases of red cypress ties lasting for 28 years; but this is the rare exception. These figures apply to cases where the ties are completely buried.

We find, then, that the life of the average tie is about six years. In other words, one-sixth of the entire track must be renewed with ties every year. If the cost of the tie were the only item of expense that entered into this question it would be bad enough; but most street railway tracks are laid on paved streets, and the cost of tearing up and renewing this paving is the large item of expense, to say nothing of the loss in receipts on account of the temporary abandonment of schedules, and the inconvenience to property owners.

Some capable engineers have recommended metal ties. But those who have had experience with them are not so well pleased.

Why not then adopt the method so extensively used by the steam roads of foreign countries and by some of the roads in our own country. That is, treat the tie with creosote (dead oil of coal tar). This process has been used for 60 years, and has proved successful wherever used. Is it unreasonable then, to expect it to materially lengthen the life of a tie? The government creosotes much of the timber used in bridge and dock work. But as said before, the street railways have taken to this process very slowly. It is, to some extent, a matter of conjecture as to the actual life of a creosoted street railway tie, as the process has not been employed long enough to prove the matter. But conservative estimates place it at 24 years, just four times as long as the ordinary tie. Let us look into this process as applied to street railway work.

The best tie for the purpose is the old field pine sap tie, for the reason that there is so much volatile matter which can be driven off, giving way to a larger amount of the creosote. Any tie, however, of this kind may be used.

The creosoting plant should be situated near the power house in order that steam from the boilers may be utilized. It should also be convenient to the steam road so that the tank cars loaded with oil may be run directly to the reservoir tanks.

The outfit for a creosoting plant should be:

Reservoir tanks to receive the oil from the railroad cars,  
One vacuum pump,  
One oil pump,  
A chamber for treating the ties,

This last, ordinarily, is a boiler about 5 ft. in diameter and 40 ft. long. This length being sufficient to accommodate ordinary trolley poles. The chamber is lined with coils of steam pipes for steaming the green ties. It is also convenient to run a small tram track from the tie pile into the chamber. The process of treating is as follows:

The ties are placed on the small tram cars and run into the chamber. (A chamber of the above dimensions will hold 175 ties.) When this is done the head is closed, a steam tight joint being made, and then bolted up. The steam is then turned on at about 20 lbs. pressure, this pressure varying, however, as the ties are green or dry; the very green tie requiring some 30 lbs. The steam is left on for six hours, during which time the rosin or other matter either evaporates or softens. The steam is then shut off, and the vacuum pump set to work. This runs for about six hours, maintaining a vacuum of 24 in. All the soft matter is drawn out of the ties, leaving them very porous. The vacuum pump is then shut down and the oil pump set to work. This pumps the oil from the reservoir tanks into the chamber. Usually two or three hours' pumping at 80 lbs. pressure will be sufficient to fill the now porous tie with oil. This, however, depends on the density of the tie. Oak ties, being denser and not absorbing the oil so readily, require higher pressure and longer pumping. Field pine ties 5 in. x 9 in. x 7 ft. have been known to absorb 6 gal. of oil, while 3 gal. is about the maximum for oak. The man in charge of the pumps soon learns this, and governs himself accordingly.

When the pressure pump is shut down the surplus oil is drained back into the reservoir and the ties are allowed to stand for a short while, when they are taken out and piled up.

If the creosote plant is conveniently near the power-house so that it can receive the supervision of the chief engineer, it can be operated easily by a \$1.50 per day man, requiring assistance only to charge and uncharge.

A complete treating can be made every 24 hours by charging the chamber late in the afternoon and having the night engineer or watchman to turn on the steam about midnight, so that when the man in charge comes to work next morning he finds the ties already steamed, and all that he has to do is to work the vacuum pump and then the oil pump.

Not ties only, but trolley or bracket poles can also be successfully treated in this manner.

A creosoting plant for street railway purposes need not be equipped on a large scale, and consequently can be installed for a comparatively low figure. While a building would be better, still a frame shelter is all the covering absolutely necessary, provided the tanks and pumps are well painted.

Now as to the relative costs of the creosoted and the untreated ties. In the writer's city pine ties 5 in. x 9 in. x 7 ft. for creosoting purposes costs 20 cents each, delivered at the plant. These will average about four gallons of oil, which at 7 cents per gallon runs the price up to 48 cents; then add 2 cents labor, and we have the creosoted tie costing 50 cents. This seems a stiff price for a tie; but let us examine further.

A careful estimate of the labor required to tear up and relay the paving incident to renewing ties has shown the cost to be 36 cents per lineal foot of track where the ordinary Belgian block paving was used. With the creosoted ties costing 50 cents, and spaced 2½ ft. center to center, they would cost 20 cents per lineal foot of track, thus making the renewed track cost 56 cents per foot. This track would then be good, so far as the ties were concerned, for 24 years.

On the other hand, a good pine tie for track work costs 25 cents, and spaced 2½ ft. center to center, would cost 10 cents per lineal foot of track; to this add 36 cents labor for paving, etc., and we have the track costing 46 cents per lineal foot. Now as this track is good for six years only, and the creosoted for 24 years, then the ordinary track costs \$1.84 for 24 years, while the creosoted costs only 56 cents for the same time. This does not include the interest on the investment in either case; but the interest on the cost of a small plant would hardly equal that on the increased number of ordinary ties renewed each year. This, however, is a matter which one can easily figure out.



The calculations above are based on actual prices in the writer's city, and which would vary with different localities, according to the proximity of a lumber and oil market. But in no case would the change be very great.

This process is so very simple and effective that street railway men will do well to look into it with a view to adopting it. And they will find that aside from effecting a considerable saving it abates one of the greatest nuisances with which we have to contend—torn up streets.

## STANDARD RULES AND REGULATIONS.

With the verbatim report of the Boston convention of the A. S. R. A., Secretary Penington also sent to the members of the Association copies of the report of the committee on standard rules and regulations for the guidance and government of employes.

This committee comprised of E. C. Foster, Ira A. McCormack and W. F. Kelly; the report bears date, Columbus, O., October 13, 1898. In the letter of transmission the committee explains that the rules have been compiled for electric railways, as there are few but few horse or cable systems, and they are rapidly passing away. No claim is made for originality, and such features as were deemed desirable in the rule books of various companies have been to some extent included in the report. Minor details of punishment for neglect of duty or infraction of rules have been omitted, but the suggestion is made that punishment involving suspension from duty be made as infrequent as possible, consistent with good discipline.

The report is too voluminous for us to print in full, and we abstract a few of the rules which are either specially important or suggest change from present prevailing practice.

In general it is recommended that roads should have a standard of physical requirements, and that applicants for the position of conductor should be not less than 5 ft. 8 in. in height, weigh 160 lbs., with sound hearing, heart and lungs, good eyesight without the use of glasses, not crippled in the hands or feet, without constitutional disease, and be between the ages of 24 and 40. Motormen should conform to the same standard, except as to weight, which should be 175 lbs.

Car service employes should have a fair common school education, be able to read English intelligently, sign their names legibly and perform simple arithmetical operations, and should be of temperate habits.

Desirable applicants should be accepted only on trial, and should be under the instruction of skilled and competent employes for from one to two weeks; when so acting as instructor, employes should receive from 25 to 50 cents extra per day.

Promotions to the regular ranks from the extra list should be solely on merit, and independent of priority of employment.

The bell signals recommended are:

### CONDUCTORS TO MOTORMEN.

1. One tap of the bell is the signal to stop at the next crossing or trolley station, whichever comes first.
2. Two quick taps of the bell is the signal to start.
3. Three quick taps of the bell when the car is standing still is the signal to back.
4. Three quick taps of the bell when the car is running is the signal to stop immediately. This signal should be used to prevent accidents, or when trolley is off the wire.

### MOTORMEN TO CONDUCTORS.

1. Two quick taps of the signal bell when car is running is the signal to conductor to set rear brake.
2. Three quick taps of the bell when the car is standing is notice to the conductor that the car must be backed.
3. Four quick taps of the bell is the signal for the conductor's aid.
4. A succession of quick taps of the bell is the signal that the trolley pole has left the wire.
5. Signal conductor by one bell for each passenger boarding the car by the front platform.

Special: You must keep your hand off the bell cord until all passengers are safely on or off, and never signal car to start until certain that it is safe to do so.

Steam Railroad Crossings: Motormen must bring their cars to a full stop not nearer than 25 ft. to the nearest track, and at a

heavy descending grade toward steam track not nearer than 50 ft., except where derailing switches are used, when special instructions will govern. The motorman must not proceed with his car until the conductor has gone ahead onto the steam railroad track and looked both ways, and given him a signal to start. The motorman will also observe the utmost watchfulness for approaching trains, and should, in his judgment, danger be imminent from any source, he will refuse to start his car until the crossing is clear and free from all danger. When conductor has gone ahead of car, before starting, the motorman will look back and see that there is no one getting on or off the car.

Transfer Signal: Four taps on foot gong in quick and regular succession is the signal to conductor that a passenger wishes to transfer to his car.

Riding on Front Platform: No one except the officers of the company and its inspectors will be permitted to ride on the front platform of closed cars under any circumstances.

Grades: In descending grades, motormen must allow car to coast, using power as little as possible; they must be very careful to always keep car under control, never allowing it to run down grade faster than the motors will take it up the same grade.

Right of Way: Cars must not pass on curves. When both reach the junction at the same time, the car on the outside track has the right of way. When two cars arrive at the junction point at the same time, the car on the main line has the right of way.

Never run against a switch point when meeting a car, but slacken the speed of the car and allow the car moving in the opposite direction to pass before striking the switch point. The rule refers particularly to all crossovers and curves having switch points facing in the direction opposite to that in which the car is moving.

Switches and Curves: Motormen must not pass over any switch until they know that the tongue is properly turned. Speed must be reduced to two miles per hour on curves. Stops must not be made on curves except to prevent an accident. It must be remembered that there is a switch on the trolley wire, and until the trolley wheel has passed it and the signal given by the conductor, current must not be turned on.

Current: When current is accidentally cut off from the power house, or by the trolley leaving the wire, or any other cause, place the controller handle on the "off" stop. Locate the trouble before starting the car. To ascertain if current is off, switch in the lamp circuit.

If there is no evidence of current, throw on the lamp circuit and notice the other cars. If they are moving, the trouble is in your car. In case the car is on a dirty rail, take a piece of insulated wire and make a good connection between the rail and the wheel. The rail may be dead, so in this case make connection between the wheel and the nearest rail. Be careful to break contact with the wheel first; otherwise, a shock will be received.

Try both controllers, and if one works the trouble is probably due to poor contact in the other. If neither controller works, ascertain whether the fuse has been blown. If the fuse is blown, remove the trolley pole from the wire before putting in a new one. Should a new fuse be blown out, pull down trolley and be towed to depot.

Free Passengers: Not more than five policemen, firemen or employes (in full uniform) will be permitted to ride free on the same car at any time (except in case of policemen and firemen going to a fire).

When more than this number board the car, you must request them to take the following car, giving the reason. If they insist on riding you must collect fare.

Employes while riding free must not smoke or occupy seats to the exclusion of passengers.

The increased traffic on the South Side Elevated, Chicago, during the past year, and the prospect of further increase as the winter approaches, are given as reasons for expecting the end of the year to show earnings of 3¼ per cent on the stock.

The Alameda (Cal.), Berkeley & Oakland Electric Railroad has temporarily stopped the sale of tickets at the rate of six for 25 cents on its lines in order to ascertain whether any counterfeited tickets are in circulation.

## PROPOSITION FOR COMPROMISE IN MILWAUKEE.

Mayor David S. Rose, of Milwaukee, on November 19, sent a communication to the common council giving in detail the correspondence between himself and C. W. Wetmore, representing the Milwaukee Electric Railway & Light Company. The mayor summarizes the proposition received from the company as follows:

### WHAT THE COMPANY WILL DO.

(1) The company to agree that it will provide the city with adequate street railway facilities, convenient and necessary for the rapid, safe and proper conveyance of its inhabitants over the streets, avenues, viaducts and bridges of the city.

(2) All franchises now held and owned by the company to terminate on July 1, 1924.

(3) The city to have the right of option to purchase the street railway property of the company at the expiration of the term of its franchises at a value to be agreed upon between the city and the company, and if they fail to agree upon the value then the value to be fixed by arbitration in the following manner: The judge of the circuit court of Milwaukee county to prepare a list of 15 freeholders, from which the city shall strike five, the company shall strike five and the five remaining shall constitute a board of arbitration to determine the price which the city shall pay for the property; or, the arbitration to consist of five persons, two of whom shall be chosen by the city, two by the company and the four thus chosen to select the fifth, as the city shall elect.

(4) In fixing the value of the property of the company, in the event that the city elects to purchase, the franchises shall not be considered to have any value and the city shall not be required to pay for them.

(5) If any extensions of lines are desired, either by the company or the inhabitants of the city, petition shall be made to the common council and the common council shall thereupon refer the petition to the judge of the circuit court of Milwaukee county, who shall prepare a list of 15 names from which the city shall strike five, the company five and the five remaining shall constitute a board of arbitration to whom shall be submitted the petition; the board may examine witnesses and make investigation of the matters involved in the petition and determine whether the public necessity requires that the extension be granted. If the board of arbitration decides against the petition no further proceedings shall be had, but if the board decides in favor of granting the petition then the proceedings shall be certified back to the common council and the common council may take such action in respect thereto as it shall see fit.

(6) The company shall pay to the city in lieu of a reduction of fares on January 1, 1899, \$50,000; January 1, 1900, \$60,000; January 1, 1901, \$70,000; January 1, 1902, \$80,000; January 1, 1903, \$90,000; January 1, 1904, \$100,000, until such time as the profits earned by the company shall pay a dividend of 6 per cent per annum to the stockholders, when there shall be paid to the city one-third of all annual profits above 6 per cent in addition to the \$100,000 per annum above provided for.

### WHAT THE CITY WILL DO.

The city upon its part to agree as follows:

(1) That in consideration of the payments to be made by the company to the city and of the other agreements hereinbefore stated in general form the company to have the right to charge 5 cents for each single fare with one transfer for each fare paid; transfers to be issued in the same manner in which they are now issued, under existing practices.

(2) A grant of the right to lay tracks and operate the street railway over certain streets contiguous to the present system to be specified and to be operated in connection therewith upon the express condition, however, that the company shall not use, occupy or lay tracks upon or operate its street railway over any street, avenue, bridge or viaduct until application or applications therefor shall be made to the common council; every such application to be first referred to the board of arbitration appointed from the list made by the judge of the circuit court in the manner above specified, the application to be approved by such board of arbitration and also to be approved by the common council.

(3) No exclusive franchise to be granted by the city to the railway company.

(4) The payments herein provided for to be independent of and in addition to all taxes, assessments, license fees or charges exacted from said railway company under any law of this state.

These further rights to be secured to the city:

(1) At the expiration of the present franchises, to wit: on July 1, 1924, if the city shall not be then satisfied to continue under the present arrangement the matter of fares and payments by the company to be readjusted under a new agreement to be then made, and if so adjusted, or if the city shall be satisfied to continue under this agreement and if the city shall not desire to purchase at that time then the terms of the franchises of the company to be extended for 10 years, in which event the city shall have the right of option to purchase at the expiration of the 10-year periods and under the same conditions the franchises may be extended by 10-year periods if the city so elects.

(2) The city to reserve the right by ordinance or resolution to regulate and control the manner of laying tracks, stringing wires, attaching circuits, and regulating and controlling the management and operation of the railway company in the exercise of any and all rights granted thereunder.

(3) In the event that the city shall exercise its right of option to purchase and shall purchase the lines of the company within the city, if the company shall then have in operation suburban or interurban lines outside of the corporate limits of the city or connected therewith, the company to have the right to run its cars over the lines within the city from such outside lines and to pay the city proper compensation therefor and to purchase power from the city for the purpose of operating such outside lines and cars from the same over the lines owned and operated by the city.

(4) All moneys received by the city from said company, under the provisions hereof, to go to the school fund of the city, and not to be diverted therefrom.

(5) If the city shall at any time hereafter grant franchises to any other persons to operate street railways within the city, then all rights and provisions thereof to terminate.

(6) The railway company to be required to maintain so much of the streets used by it and one foot outside the tracks and keep them in good repair and condition with the same material used by the city to maintain, pave or repair the other portions of such streets.

(7) Before any ordinance or resolution adopted to carry into effect the provisions hereof shall become operative or of any force the railway company to execute a contract to the city, to be approved by the common council by which the railway company shall obligate itself to well and truly keep and perform all and singular the acts and things by it required to be done in pursuance of this proposal and the ordinance and resolution adopted in conformity therewith; and also to make all the payments therein provided for and to provide the city with the street railway service specified in the ordinance, the performance of all of which shall depend all the rights of the railway company under such ordinance, and if the railway company shall become insolvent or shall violate or fail to keep any condition or agreement by it to be kept or performed by the provisions of the ordinance, then the ordinance and all rights thereunder to terminate.

The text of the agreement further provided that the company should be relieved of the payments to the city in the event that the city should at any time grant franchises to any opposition company. This is perhaps not clearly brought out in section 5 of the "further advantages" above quoted.

So great an outcry was made against this agreement by the press and public generally that the company withdrew its proposition, and the matter will probably be dropped, as the city will be unable to force a reduction in the rate of fare to 4 cents, which is the point most controverted.

The proposal was made in an effort to come to amicable terms with the city. While the franchises for many of the streets occupied by the company terminate in 1924, there are many others, however, which expire between 1929 and 1934, and some that are in perpetuity. The date 1924 in the agreement was chosen as most favorable to the city.

J. B. Quigley, who is building an electric railway at Nevada, Mo., has purchased the electrical equipment of the Westinghouse Company.



BRIDGES AT CINCINNATI.

The accompanying illustrations are from photographs of the bridges crossing the Ohio river which are used by the Cincinnati, Newport & Covington Railway Company. Those on the left show the suspension bridge which has been rebuilt for the use of the street railway company at a cost of \$185,000. During the two years that the reconstruction work has been in progress, traffic has not been interrupted for a single hour. This bridge

LIGHTNING AND LIGHTNING ARRESTERS.

Abstract of a Lecture before the Franklin Inetitue, November 22, 1898, by A. J. Warts.

In earlier days, when little was known about electrical phenomena, fires were lighted and bells tolled to frighten away the lightning; but when Benjamin Franklin, with his remarkable kite experiments, established the identity between lightning and electricity, people were glad to accept his demonstrations and



CINCINNATI BRIDGES.

saves 15 minutes in the trip between Cincinnati and Covington by street cars and is of course a great convenience.

Those on the right show the new Louisville & Nashville Railroad bridge, which is considered the best bridge across the Ohio at this point. It connects Newport with Cincinnati, the northern end landing passengers at the Pennsylvania Railroad Depot. There are two street car tracks on this bridge for the Cincinnati, Newport & Covington, and one track for the Louisville & Nashville.

SALES IN BROOKLYN.

November 10 the Brooklyn Elevated, the Union Elevated and the Brooklyn Bridge & Seaside Elevated Railroads were sold under foreclosure proceedings to F. B. Olcott, representing the Central Trust Company, the bids were \$1,750,000; \$3,075,000, and \$682,500 for the three roads. The three companies will be consolidated and known as the Brooklyn Union Elevated Railroad Company, and it is stated that Frederiek Uhlmann, the present receiver, will be the new president.

ready to adopt such a reasonable device as Franklin's rod to protect self and home against the dreaded lightning.

The lightning rod at that time was a reasonable device. First, because lightning, having been proved to be identical with the static spark, a metal rod would obviously constitute a good conductor; and, second, as points were found to possess the property of draining the charge, that is, preventing the accumulation of the charge, the lightning rod had every reason in the light of 100 years ago to be considered a good preventive against the stroke, as well as a good conductor should the stroke occur. (Experiments were here shown to illustrate these points.)

But after 100 years of experience shall we still consider the lightning rod a reasonable precaution? For some reasons I think it is; it certainly gives comfort to many nervous people. On the other hand, there is no evidence that it does any harm. However, aside from any comfort which the rod may offer to timid people, is it in the light of today a reasonable precaution, and does it pay? With some few exceptions, I would say no. If money is plenty and to spare, and if the rod will give comfort



and ease of mind, by all means put it up, but as a matter of fact where do we find the great majority of rods today? Not on new houses, where wealth and intelligence are the rule, but on public buildings, old houses and the houses of the relatively poor and uneducated. Why is this? I think it is because the well-to-do people are in a position to use their own judgment, and they decide that the danger does not warrant the expense. They are found on public buildings because lightning rods, being used in all civilized countries, no one is willing to take the responsibility of leaving them off; and they are found on the houses of less intelligent people because these are not in a position to use any judgment of their own in the matter; they are fearful because they don't understand, and they are easily frightened into it by the lightning rod agent.

From statistics (Alexander McAdir, U. S. Weather Bureau) we learn that in nine years, ending 1893, in the United States, and for the most part east of the Rocky Mountains, there were 4,175 fires, with a loss of \$14,309,015; that during ten years, ending 1893, 2,679 barns, 129 churches and 831 dwellings were struck by lightning. This is 831 dwellings in 10 years, less than 100 a year, out of the millions in this country! Can this cause alarm or be considered sufficient ground for the general erection of lightning rods, or will it be argued that the use of lightning rods has kept these figures down?

But again, statistics show that in Belgium for 1889 "of 324 lightning flashes two struck lightning rods; 123 struck buildings, setting 36 on fire; 16 struck persons; 96, trees; 81, telegraph and telephone lines; and others miscellaneous. Other statistics show that of 18 deaths due to lightning, one occurred within a building, 11 out of doors and 6 under trees."

Certainly, these figures are not alarming. Taking the maximum figure for five years, in 1894 336 people out of seventy millions were killed in the United States by lightning. Indeed, there is more danger from the air we breathe and the water we drink than from lightning. If we are to use lightning rods to ward off such a remote danger as damage or death by lightning, why not have automatic sprinkling devices in our houses to guard against fire? Why not pad railroad cars with air cushions to lessen the possibility of death in collision? Why not fasten a small lightning rod to our umbrellas when we go out in a thunder storm? Indeed, there are hundreds of other dangers far greater than lightning, against which were we to take such precautions as are suggested by the lightning rod, life would hardly be worth living.

If we knew just when lightning was going to strike, and if we knew that a rod would protect, then, indeed, would the rod prove a reasonable precaution; but when we realize that of the people killed by lightning, most of them have been out of doors, standing under trees, that most of the buildings struck by lightning are barns or stables, that out of 324 strokes only two struck lightning rods, then it is hard to believe that the lightning rod is a reasonable precaution. We have had 100 years experience; facts and statistics are before us, and my observations indicate that the majority of intelligent people have decided against a general use of the lightning rod.

Nevertheless, lightning rods have undoubted value in certain places. I would consider them advisable on all buildings of prominence, such as the capitol at Washington, the Washington Monument, churches, tall brick chimneys, etc., but otherwise in cities the danger from lightning does not seem to warrant their use. In the country it is undoubtedly well to protect barns and churches, and I see no reason why valuable trees when standing more or less exposed should not be thus protected.

It is often claimed that a rod will protect an area having a radius equal to the height of the rod, but this is not so, as experience has frequently demonstrated. I remember an instance last summer in which a tree was struck not more than 50 ft. from the hotel where I was stopping, and this building, which was 300 ft. long and four stories high, was provided with an admirable system of lightning rods, having 40 upper terminals and several lower terminals thoroughly well grounded. During the same storm another tree was struck not more than 200 ft. from the hotel; the stroke shattered the tree about one-third of the way down, from which point it jumped to a telephone wire attached to the tree, and following this into the hotel; it finally reached a gas pipe and thus passed to earth. The path taken by this stroke was certainly circuitous compared with the path

offered by any one of the lightning rods of the hotel. Shortly after this a tree was struck 10 ft. from a neighboring hotel equally well protected. It will thus be seen that the law above enunciated does not hold good, and that lightning rods are by no means a sure preventive of the stroke, nor does the stroke necessarily follow what, from an electrical standpoint, would seem to be the shortest and easiest path to earth. (A very interesting experiment was here shown illustrating the formation of a lightning stroke.)

Before passing to the subject of lightning arresters, I wish to say a few words about "fire balls." This is a form of lightning which is comparatively rare; in fact, many people doubt its existence. I have never observed this phenomenon myself, but I have the good fortune to be acquainted with J. P. Mallett, one of the engineers of the Westinghouse Electric & Manufacturing Company, who personally witnessed this form of lightning, a description of which he has kindly given me. I will read it to you in his own words:

"The following is a brief account of a severe thunder storm I experienced in the southern portion of Maine, the latter part of August of this year.

"I chanced to be visiting my brother at the time, and about six o'clock in the evening a heavy shower occurred and the thunder and lightning were very severe. The lightning struck the chimney of my brother's house, breaking out first in the rooms on the third floor on both sides of the chimney. In one room it came out through the plastering in a number of different places, and tearing off the plaster apparently divided into several different parts. One bolt went across the end of a picture frame, and from this to an old pair of souvenir Japanese shears, fusing the points together, then, passing back through the plastering to the chimney, it descended to the next floor. Here, on each side of the chimney was a bed room, with a set of wash bowls in each. In one there was a little water. The lightning fused the stopper chains to the bowls, and the bowl which contained the water was broken into many pieces. To the other it did no damage except fusing the chain and blackening the marble slab.

"The lightning passed around one bed room to the corner opposite the bowl, and from there passed down to the room below. Here my brother happened to be standing, and at the doors were three others, among them myself. We saw distinctly two balls of fire, apparently about as large as a fist, one coming from the room above already mentioned and the other from the funnel hole in the chimney. These approached each other in about the middle of the room and approximately 2 ft. from the floor, and when apparently about 2 ft. from each other they exploded about the same time, one report being almost simultaneous with the other. My brother was standing at the time within 4 or 5 ft. of the balls, and felt a slight shock in the lower part of his legs, but nothing severe. We who were standing in the next room in the doorway felt no shock at all.

"The lightning set fire to nothing and showed no signs of burning except in the rooms on the third floor, where it came through the plastering and charred the lathing around the nails. The chief damage done was by the explosions, which occurred at the wash bowls and in the chimney itself. These blew out the funnel hole covers on every floor and severely cracked the chimney in several places.

"This storm was noted throughout that section for the peculiar freaks of lightning in several different places, and in every case it seemed to be of the same globular form."

We now pass to the consideration of lightning arresters.

Atmospheric electricity is the cause of considerable damage to electrical apparatus, and lightning arresters are used as a protection. The difference of potential between the upper strata of air and the earth is often considerable. During thunder storms a difference of 3,000 volts has been found at the top of the Washington monument and 10,000 volts at the top of the Eiffel tower. The atmosphere under these circumstances becomes an electrostatic field, which, when suddenly removed, causes electrostatic surging in all electrical conductors, as well as static discharges. The instantaneous removal of the electrostatic field takes place at the instant of the lightning flash. This is noticed by reading the instruments when measurements of the difference of potential are taken at any considerable elevation, as for instance at the top of Washington Monument. It is



noticed that just previous to a lightning stroke the potential is constantly and gradually rising, but the moment the stroke occurs the potential immediately falls to zero. The effect then of this sudden removal of the electrostatic field is to cause surging in electrical conductors, which in turn give rise to static discharges of an oscillatory nature. It is for this reason that wire fences, iron rails, gas pipes and the like are frequently seen to spark during thunder storms. In the case of gas pipes the sparking is a source of considerable danger, because should there be a leak at one of the joints, the spark would ignite the gas and possibly cause a serious fire.

It is this static discharge or spark which causes damage to electric apparatus by perforating the insulating material, and the object of a lightning arrester is to conduct the discharge to earth, that is, it is intended to provide a path or such a number of paths to earth that the line will always be safely discharged without affecting the apparatus. The oscillatory character of the discharge lends itself readily to the construction of one type of protecting device, namely, the choke coil; on the other hand, it is this very characteristic which has made it so difficult to construct an effective lightning arrester, an instrument which otherwise would seem to be a very simple device. The charge in the wire seems to surge back and forth with a high frequency and obtains thereby the property of self-induction. It is therefore necessary in constructing a lightning arrester to provide a path for the discharge which will offer minimum resistance to the passage of disruptive discharges in distinction from a path offering low resistance to the passage of ordinary dynamo currents. For example, any device having a coil wire in the path of the discharge would offer a considerable resistance to the passage of the discharge, although it might prove a very low resistance path for dynamo currents.

In the early days of electric lighting a simple spark gap was provided between line and ground, across which the static spark passed to earth, but as in many instances the dynamo current followed the discharge across this gap, a fuse was inserted which would instantly cut out the arrester in case of a short circuit. This answered fairly well for a time, but as electric light and power plants increased in number and size, a demand was made for a lightning arrester which would automatically take care of itself. A considerable number of such devices have since been placed on the market, several of which are on the table before you, and I will now endeavor to show you experimentally their respective characteristics and the comparative resistance which each offers to the passage of disruptive discharges.

## NORTH CHICAGO RAILROAD OFFICES.

The office building of the North Chicago Street Railroad Company at 444 North Clark street is being enlarged to afford better accommodation for the business of that company and allied interests. In addition to the North Chicago, the Northwestern Elevated Railroad Company, the North Chicago Electric Railway Company, the Chicago Electric Transit Company, North Side Electric Street Railway Company and the Chicago & Jefferson Urban Transit Company all have offices in this building.

J. R. Chapman, electrician of the company, drew the plans for the addition, which is constructed of iron and terra cotta, and is fire-proof. It is a three story structure and immediately at the rear of the old building. It provides accommodation for two law departments of four offices each, two claim departments of three offices each, the engineering offices of the Northwestern Elevated Railroad Company, a private office for President Yerkes and his stenographer, a suite of offices for J. M. Roach, second vice-president and general manager, office for the electrical department of the North Chicago and allied companies, a telephone exchange room so that all the offices have telephonic communication; conductors' room, lockers and lavatory for the employes of the North State street line.

The casings in each room are grooved so that wires for telephone, lights, Postal calls, etc., can readily be placed at any time in any room. The construction of the building was commenced last August and is now nearing completion. Its cost will be approximately \$30,000.

## GAS DRIVEN INSPECTION CAR.

The accompanying illustration is from a photograph of an inspection car on the Chicago & West Michigan Railway which is driven by a gas engine and is the largest of a number of such cars equipped with Sintz gas engines. This car is in some respects quite similar to a street car, and the success with which it has been operated leads the Sintz Gas Engine Company to believe



GAS DRIVEN INSPECTION CAR.

that such an equipment would prove satisfactory as well as economical on interurban railways where the objection to electric power is the heavy investment for copper. The company is prepared to build street railway cars, and has sent one equipment to Merida, Yucatan.

## STRIKE AT DALLAS, TEX.

At 4:15 a. m. on November 10, C. H. Alexander, president of the Dallas (Tex.) Consolidated & Electric Street Railway, was called up by telephone and advised that the union of employes was dissatisfied with the action of the company in discharging some of its men, and demanded their reinstatement. This was refused and at 6 o'clock a strike was inaugurated.

Three out of the 40 cars regularly used were manned by the office force and ran the first day, Mr. Alexander himself taking charge of the power house. By November 18 the cars were running on schedule time with non-union men; the passenger traffic was light, however.

Reports from Dallas state that on December 2, at 9 o'clock in the evening, a car was blown up by dynamite, and half an hour later a second car. A stick of dynamite a foot long was found at the scene of the explosion. The motorman was injured and the car badly wrecked in both instances; no passengers were on board. The company attributes these acts of violence to the strikers.

## MANHATTAN ELEVATED REPORT.

The report of the Manhattan Elevated Railway Company, of New York, for the quarter ending September 30, 1898, shows a deficit of \$20,062 as compared with a surplus of \$155,890 for the corresponding quarter of 1897. The dividends paid in 1897, however, turned that surplus into a deficit. The figures for the third quarter of 1898, and of 1897, are:

Gross earnings .. . . .	\$1,788,613	\$1,970,238	Dec. \$181,625
Operating expenses . . .	1,249,003	1,264,706	D. c. 15,703
Net earnings .. . . .	\$ 539,610	\$ 705,532	Dec. \$165,922
Other income .. . . .	47,500	56,677	Dec. 9,167
Total income .. . . .	\$ 587,110	\$ 762,199	Dec. \$175,089
Charges .. . . .	607,172	607,083	Inc. 83
Deficit .. . . .	\$ 20,062	sur. \$ 155,110	Inc. \$175,172
Dividends .. . . .	300,000	300,000	.....
Deficit .. . . .	\$ 320,062	\$ 144,890	Inc. \$175,172

## REVIEW OF SOME OF THE 1898 STREET RAILWAY LEGISLATION.

BY J. L. ROSENBERGER, LL.B., OF THE CHICAGO BAR.

**Massachusetts.**

The "Massachusetts General Street Railway Bill," a summary of the principal features of which was published on pages 433-435 of the STREET RAILWAY REVIEW of July 15, 1898, does not comprise all of the legislation of that state for the year 1898 affecting street railways.

**USE OF TRACKS FOR TRANSPORTATION OF MATERIAL, ETC.**

Chapter 328 of Acts of 1898 provides that any corporation owning or operating a street railway within the Commonwealth of Massachusetts may, in any city with the consent of the mayor and board of aldermen, or in any town with the consent of the selectmen, convey in cars propelled by electricity or horse power over its tracks any snow, ice, stones, gravel, dirt or street sweepings which have been taken from any street or way over or through which its tracks are located, for the purpose of improving said street or way; and may also, in like manner and with like consent, convey to any point on its line any necessary material for use in the construction, grading, repairing or improving of such street or way.

**EMPOWERED TO TAKE LAND.**

Chapter 404 of the Acts of Massachusetts of 1898 provides as follows: Section 1. A street railway company, for the purpose of avoiding or eliminating a crossing of a railroad by its railway at grade, may purchase or otherwise take land necessary therefor, not exceeding 50 feet in width, outside the limits of a public way; provided, that no land shall be so taken which cannot lawfully be taken for the laying out of a railroad; nor until a plan, made on an appropriate scale and showing by metes and bounds the land proposed to be purchased or taken, with the names of the owners thereof, after notice to such owners, and after a public notice and hearing such as are required in case of a location of a street railway upon a public way, has been approved in writing by the board of aldermen of the city or selectmen of the town in which the land is situated; nor shall the land of a railroad company or of another street railway company be so taken against the consent of such company, without the approval, after notice and hearing, of the board of railroad commissioners.

Section 2. A deed or description, with a plan of the land so purchased or taken, shall be filed in the registry of deeds for the county or district in which the land is situated; and the provisions of the general laws relative to the assessment and payment or recovery of damages for lands and other property taken for railroad purposes shall apply with respect to all lands and property taken under the provisions of this act.

Section 3. A street railway company which has so acquired land for the purpose may construct its railway over or under a railroad, in the manner agreed by the companies, or, if they do not agree, in a manner prescribed by the board of railroad commissioners; provided, that no overhead structure shall be built at a height of less than 18 feet above a railroad track, without the consent in writing of said board.

Section 4. The board of aldermen of a city or the selectmen of a town may authorize structures or alterations within or partly within the limits of a public way, necessary for carrying a street railway over or under a railroad; provided, that the public way is not thereby made unsafe for other public travel, and that in the case of a state highway the consent of the Massachusetts highway commission shall also be obtained.

Section 5. A street railway company whose railway is located in part outside the limits of public ways shall, with respect to the equipment, use and operation of its railway and transportation thereon, be subject to the provisions of all general laws now or hereafter in force relating to street railways and street railway companies, as fully as if its railway were located wholly within the limits of public ways.

**TAXATION OF INTERSTATE LINES.**

Chapter 417 of the Acts of Massachusetts of 1898 provides that the provisions of sections 38 to 41, and 53 to 66, inclusive, of chapter 13 of the Public Statutes of Massachusetts, which are ap-

licable to railroad companies whose lines are located partly within and partly without the limits of the Commonwealth of Massachusetts, shall apply in like manner to street railway companies, whether chartered or organized in the Commonwealth of Massachusetts or elsewhere.

**New Jersey.****EXTENSION OF TIME.**

Chapter 189 of New Jersey Laws, Session of 1898, provides that whenever the time limited for the completion of any horse, street, electric, cable or traction railroad or railway, or any part thereof, has expired, either by the terms of any resolution or ordinance of any municipality of this state, or by the provisions of any law of this state, such time shall be and the same is hereby extended to the first day of July in the year of our Lord one thousand nine hundred; and that all acts or parts of acts inconsistent with the provisions of this act are repealed.

**RAILROADS ON IMPROVED HIGHWAYS.**

Chapter 118 and chapter 199 of the New Jersey Laws of 1898 is each entitled "An Act to authorize boards of chosen freeholders to widen, straighten, grade and otherwise improve highways under their control, and to provide for the construction of street railroads thereon."

Section 1 begins with the provision that the board of chosen freeholders of any county in the state of New Jersey shall have power to widen, straighten, change the grade or location of, or otherwise improve any public highway under its control, or part thereof, and to authorize the construction and operation of a street railroad thereon.

Section 2 provides that whenever such board intends to widen, straighten, change the grade or location, or otherwise improve any public highway under its control or part thereof, in order to provide for the construction and convenient operation of a street railroad thereon, that fact shall be stated in a resolution passed by the board, after filing a map as provided for in section 1, and published for at least two weeks, once a week, in two or more newspapers published in the county, and said resolution shall further state that at a time and place mentioned therein, and at least two weeks after the passage thereof, propositions to construct, maintain and operate a street railroad on the highway to be improved will be received and considered by the board, and all parties interested therein may be heard, or at some later date to which the board may adjourn; each proposition submitted in pursuance of such notice shall state (1) whether the party making the same intends to construct a single or double track street railroad, and if a single track road, the length and location of sidings and switches; (2) the motive power to be used; (3) the rate of fare to be charged; (4) the amount of money to be contributed for defraying the cost of improving the public highway, as proposed by said board, and the amount or percentage of receipts to be paid annually for the franchise, and (5) such other terms as the party making the proposition may be willing to agree to; and if any proposition to construct, maintain and operate a street railroad on such highway to be improved shall be accepted by said board, the party making the same shall forthwith give a bond to said board, conditioned for the faithful performance of such proposition in all respects; such bond to be approved as to form, amount and sufficiency of surety by the justice of the supreme court holding the circuit court in the county before any money shall be expended or obligation incurred in making the proposed improvement; provided, that no arrangement or agreement, made by or between the person or corporation making such proposition and the board of chosen freeholders in respect of taxation, shall be taken or construed to have the force of contract; nor shall any franchise be granted under this act for a longer term than 75 years; and provided further, that such board may reject any or all propositions, and readvertise from time to time for other propositions, and proceed thereon as in the first instance; but nothing in this act shall be construed to authorize the construction of a street railroad on any public highway on which it is not lawful at present to authorize the construction of a street railroad.



To this point the two chapters appear to be identical. But chapter 199 contains the following additional matter, not found in section 2 of chapter 118, viz.: Nor shall any street railroad be constructed on any public highway or part of any highway under the control of such board in any municipality until there shall be filed in the office of the clerk of the county the consent in writing of the owner or owners of at least one-half in amount of lineal feet of property in such municipality fronting on such highway, or upon the part thereof on which it is proposed to construct such street railroad, and any such consent may be signed by an attorney in fact thereunto duly authorized by the owner or any executor or trustee holding the legal title or having power of sale, which consent shall be executed and acknowledged as is required in case of deeds entitled to be recorded; and in case such consents are not obtained and filed within six months after the acceptance of such proposition, then such proposition and acceptance thereof and bond shall be null and void, and the board of freeholders may give notice calling for other propositions and proceed thereon in the manner aforesaid.

3. Forthwith after the approval of such bond, a copy of such proposition, certified by the clerk of the board of chosen freeholders, shall be delivered to the chairman or other presiding officer of the council, committee or other governing body of every municipality in the county through or into which it is proposed to construct a street railroad on such highway, and the work of constructing such street railroad shall not be commenced or carried on in any municipality in the county until the governing body thereof shall by ordinance assent thereto.

Chapter 199 repeals all acts and parts of acts inconsistent therewith.

### New York.

#### CERTIFICATES OF PUBLIC CONVENIENCE.

Chapter 643 of the New York Laws of 1898 adds a new section to chapter 565 of the Laws of 1890, known as the railroad law, the same to be known as section 59a. This new section provides that whenever application is made by a street surface railroad company for a certificate of public convenience and a necessity as required by the provisions of the foregoing section, and it shall appear to the board of railroad commissioners, after examination of the proposed route of the applicant company that public convenience and a necessity do not require the construction of said railroad as proposed in its articles of association but do require the construction of a part of the said railroad, the board of railroad commissioners may issue its certificate for the construction of such part of the said railroad as seems to it to be required by public convenience and a necessity.

In case any railroad company which shall hereafter obtain the certificate of the board of railroad commissioners that public convenience and a necessity require the construction of the whole or a part of the said railroad shall fail to begin such construction within two years from the date of the issuing of said certificate, the board of railroad commissioners may inquire into the reason for such failure and the said board may revoke said certificate if it shall appear to it to be in the public interest so to do.

#### TRANSFER TICKETS.

Chapter 663 of the New York Laws of 1898 adds a new section to the penal code of the state, to be known as section 619a. It provides that no transfer ticket or written or printed instrument giving, or purporting to give, the right of transfer to any person or persons from a public conveyance operated upon one line or route of a street surface railroad to a public conveyance upon another line or route of a street surface railroad, or from one car to another car upon the same line of street surface railroad, shall be issued, sold or given except to a passenger lawfully entitled thereto. Any person who shall issue, sell or give away such transfer ticket or instrument as aforesaid to a person or persons not lawfully entitled thereto, and any person or persons not lawfully entitled thereto who shall receive and use or offer for passage any such transfer ticket or instrument, or shall sell or give away such transfer ticket or instrument to another with intent to have such transfer ticket used or offered for passage after the time limited by its use shall have expired, shall be guilty of a misdemeanor.

#### EXTENSION OF TIME FOR COMPLETION OF ROADS PLACED IN HANDS OF RECEIVERS.

Chapter 495 of the New York Laws of 1895 provides that all railroad corporations that have been organized under the laws of this state, and have been placed in the hands of a receiver or receivers by the supreme court of this state, and that are now in the hands of such receiver or receivers, are hereby granted five years from and after the passage of this act within which to complete their said roads, and the charter or charters of such companies shall not be deemed or taken as forfeited by their failure to complete their said roads within the time originally limited in the general laws of this state for the completion of such roads. And the said companies are hereby authorized to proceed and build their said roads and complete the same within five years after the passage of this act, and the corporate powers and rights shall not be deemed or held to have ceased by reason of lapse of time or by reason of the appointment of such a receiver or receivers.

#### STOCK CORPORATION LAW.

Chapter 80 of the New York Laws of 1898 amends the railroad law of the state by adding to article one a section, to be numbered 23, to read: Section 24 of the stock corporation law does not apply to a railroad corporation.

[Said section 24 pertains to "Liability of directors for unauthorized debts and over-issue of bonds."]

#### IN RELATION TO THE POWERS OF ELECTRIC LIGHT AND POWER CORPORATIONS.

Chapter 170 of the New York Laws of 1898 amends section 21 of the railroad law, as amended by chapter 648 of the laws of 1894, relative to the powers of electric light and power corporations, so that the stockholders of a domestic company incorporated under a special law will now have the same power as those of a company incorporated under a general law; either corporation being empowered to build, maintain and operate by electricity as a motive power a railroad "or railroads," not exceeding "twenty-five" miles in length, and within that distance from the power station.

As the section is amended, an electric light and power corporation shall also have the right to acquire the property and franchises of a railroad company or companies owning such a railroad or railroads, already constructed, and so operated, and to maintain and operate the same, provided that the directors of such railroad company or companies and all of its or their stockholders shall first have assented in writing to the transfer of the property and franchises of such railroad company or companies, to such corporation; in which event and by the filing of such assent of directors and stockholders in the offices where the certificates of incorporation of the railroad company or companies were required to be filed, the rights, property and franchises of such railroad company or companies shall be transferred to, and shall vest in such corporation, and such corporation so acquiring such railroad or railroads shall be subject to all the provisions of chapter 39 of the general laws with respect to the railroad property or properties and franchises.

But it is stated that this section shall not confer any powers upon any corporation located in or authorize the construction, maintenance or operation of a railroad in a city of the first or second class.

#### CROSSING OF BRIDGES.

Chapter 590 of the New York Laws of 1898 amends section 96 of the railroad law, making the same applicable to "Any street railroad in operation in this state, which shall, by a two-thirds vote of its directors, decide to extend the route of its road, so as to cross a river over and by any bridge," and adds to the section: Whenever a terminus of any public viaduct, bridge or bridges, or public viaduct connected with any bridge or bridges, heretofore or hereafter constructed in and owned and maintained by any city of the first class, or town adjoining the same, is or shall be located at or adjacent to or within one-half mile of the route of any existing street surface railroad the corporation owning or operating such railroad may, irrespective of any provisions otherwise applicable thereto contained in any general or local act, upon obtaining the consent of the local authorities and property owners as above [in the original section] provided, and upon complying with the provisions of the railroad law applicable

thereto, extend its road or route and construct and operate its railroad, to, upon and across such viaduct, bridge or bridges and approaches thereto for the purpose of connecting with another railroad route not more than one-half mile distant from such bridge or viaduct so as to afford a continuous ride for one fare, subject to the provisions of the railroad law. This section shall not apply to any bridge over the Hudson or East rivers in the counties of New York and Kings, nor to any bridge or viaduct constructed under the provisions of any, so-called, grade crossing law.

#### INTERLOCKING DEVICES.

Chapter 466 of the New York Laws of 1898 amends section 36 of the railroad law, which enacts that "Locomotives must stop at grade crossings," by inserting, before the last sentence: The board of railroad commissioners may, whenever in its judgment the public safety requires the erection of interlocking switch and signal devices at points where steam and street surface railroads intersect at grade, direct the erection of such devices and apportion the expense of construction, operation and maintenance thereof between the companies affected thereby.

### Ohio.

#### COMPULSORY INTERLOCKING.

Section 3 of the act entitled "An act to protect persons and property from danger at grade crossings of one railroad over another," etc., which was passed and took effect April 27, 1896 (92 O. L., pages 315-7; St. Ry. Rev., Feb., 98, page 88), has been amended in 1898 (93 O. L., 334), so as to read as follows:

"Sec. 3. In case, however, one railroad company or an electric railroad company shall hereafter seek to cross at grade with its track, or tracks, the track, or tracks, of another railroad, the railroad company, or the electric railroad company, seeking to cross at grade shall be compelled to provide interlocking or other safety devices put in to the satisfaction of the said commissioner of railroads to protect such crossing, and to pay all costs of such appliances, together with the expense of putting them in. The future maintenance and operation thereof shall be equally apportioned between the two or more roads by the said commissioner of railroads and telegraphs; provided this act shall not apply to crossings of side tracks only."

The principal changes made are in providing for the possible use of "other safety devices," instead of peremptorily compelling interlocking the crossing, and in making the future maintenance and operation to be "equally apportioned" between the roads, instead of leaving that expense to be borne entirely by the one company.

#### WIRES OVER STEAM RAILROADS.

An 1898 act, entitled "An act for the better protection of trainmen employed on steam railroads" (93 O. L., 154), provides: "That hereafter all telegraph, telephone, electric light or other wires of any kind constructed over the line of any steam railroad within the state of Ohio shall be put up on good, substantial poles of a size not less than 12 inches in diameter at the bottom and not less than six inches in diameter at the top and that they be set in the earth not less than one-sixth of their length and well tamped. Double cross-arms shall be used in all cases and all wires shall be insulated with glass or porcelain insulators, and securely fastened to both cross-arms. All wires to clear the top of the rails at least 25 feet, except in cases of trolley wire crossings, when such height, as may be agreed upon, is approved by the commissioner of railroads and telegraphs shall govern. When there is side-strain, poles shall be well guyed or braced."

It is made the duty of the said commissioner to see that the provisions of this act are enforced, and he is empowered to cause the removal of any wires hereafter constructed over any railroad within the state of Ohio not constructed according to the provisions of this act.

#### LEASING OR PURCHASING POWER.

House Bill No. 1, passed January 20, 1898 (93 O. L., 3, 4), repealed section 2505d of the Revised Statutes of Ohio as enacted April 22, 1896 (92 O. L., 278, 9), which latter related to "Agreements as to terms and conditions of grants in case of lease, purchase, consolidation, etc.;" "Fifty-year grant in lieu of foregoing," and "Municipal power as to rates and other terms and conditions."

Senate Bill No. 25, passed April 23, 1898 (93 O. L., 214, 5),

amends section 2505a of the Revised Statutes of Ohio, as enacted April 22, 1896 (O. L., 277), granting "Power to lease or purchase, to let or sell, to enter into beneficial arrangement, to purchase stock, etc."

The 1896 enactment began: "Any corporation or company organized for street railway purposes may lease or purchase any street railroad or street railroads, or railroad operated as a street railroad, by electric (cable or other rapid transit motive) power, or inclined plane railroad or railroads," etc. The 1898 substitute begins: "Any corporation or company organized for street railway purposes may lease or purchase any street railroad, or street railroads, or railroad operated as a street railroad (and) by electric power or inclined plane railroad or railroads," etc. The differences between the two will be found in the words which have here been enclosed in parentheses.

The 1896 enactment ended with the words: "And any such corporation or company may purchase and own all or any part of the capital stock of any such corporation or company in this or adjoining states, whose lines or authorized lines of road intersect or connect, with the route or lines of the corporation or company making such purchase." The 1898 amendment drops that, and has, instead, this: "Provided, that, whenever any such lease or purchase is made as herein provided, there shall be no increase of the existing rates of fare by reason of such lease or purchase, nor shall any fare be charged upon any of the separate routes so leased or purchased in excess of the fare charged over such separate routes prior to the lease or purchase thereof, and provided that when any such lease or purchase is made as herein provided, the fare charged for one continuous route or ride in the same general direction over all such leased or purchased lines within any municipal corporation shall not exceed the maximum fare charged over any one of said lines prior to such lease or purchase."

#### LIGHT AND POWER BUSINESS.

Senate Bill No. 482, passed April 19, 1898 (93 O. L., 139, 40), provides that section 2505e be enacted as supplementary to section 2505a of the Revised Statutes of the state of Ohio, as amended April 22, 1896, as hereinafter set forth, to wit:

"Sec. 2505e. Any corporation or company maintaining and operating a street railroad may lease or purchase all the property, real, personal and mixed, and all the franchises, rights and privileges of any company organized prior to the date of the enactment of this supplementary act, for the purpose of supplying electricity for power and light purposes, or which has been engaged in such business in whole or in part in any city within this state, the latter being hereby vested with corresponding power to let or sell, upon such terms and conditions as may be agreed upon between the corporation and company. No such lease or purchase shall be perfected until a meeting of the stockholders of each of the companies has been called for that purpose by the directors thereof, on thirty (30) days' notice to each stockholder at such time and place and in such manner as is provided for the annual meetings of the companies and the holders of at least two-thirds of the stock of each company in person or by proxy, at such meeting, or at any properly adjourned meeting assent thereto. Provided, that any stockholder who refuses to assent to such lease or sale and so signifies by notice in writing to the lessee or purchaser within ninety (90) days thereafter, shall be entitled to demand and receive compensation in the manner provided for the compensation of stockholders in sections 3302, 3303 and 3304 of the Revised Statutes, and the said sections are adopted and made a part of this section. Any such company so leasing or purchasing the property, rights and franchises of an electric light and power company shall have all the rights, power and authority that electric light and power companies now have, or may hereafter have, by the statutes of this state, but the liability of any electric light and power company shall in no manner be affected by its lease or sale as herein provided."

### Virginia.

#### USE OF VESTIBULE FRONTS.

Chapter 181 of the Acts of Assembly of the State of Virginia of 1898 provides that all city and street passenger railway companies be, and are, required to use vestibule fronts on all cars run, manipulated or transported by them on their lines during the months of December, January, February and March of each



year; provided, that said companies shall not be required to close the sides of said vestibules, and any street railway company refusing or failing to comply with said requirement shall be subject to a fine of not less than ten dollars or more than one hundred dollars for each offense; provided, that the provisions of this act shall not apply to the street railway lines of the city of Petersburg.

INTERESTING CARS FOR SOUTH AMERICA.

Some years since the J. G. Brill Company furnished a large number of cars for the Tramway Rural of Buenos Aires. The road, when it was first put in operation, used animal power entirely. The line is 200 or more miles in length, and both sleeping and parlor cars were furnished to it, its great length making these quite necessary for the travel. They were, of course, operated like the other cars, by mules or horses. The road was of standard gage, 4 ft. 8½ in.

for the sleeper and dining car are shown in Fig. 1. This car, with its open central section, was built complete ready to receive the sleeping car body when it arrived in Buenos Aires.

The car, with kitchen and dining compartments at the ends (Fig. 1), is 33 ft. long over all, 7 ft. 11 in. wide over all, and the height to the sill is 35 in. In the dining compartment, shown in Fig. 2, there is a closet for china and glass, fitted with plate glass doors; this closet is 1 ft. deep and is placed against the end of the old (central) car body. The floor of this compartment, and also that of the kitchen, is covered with linoleum.

In the kitchen (Fig. 3) are placed at one side an oil stove, refrigerator, copper sink, pump and tank. On the opposite side is a bunk which opens out to form a double bed. Inside of this is space for packing the mattresses. A cupboard, supported on fancy brackets, completes the furniture of the kitchen. Double lamps were provided for both kitchen and dining room.

The trucks are of the steam-railroad type, with 30-in. wheels. Fig. 4 shows the platform and observation ends, which carries



CARS FOR TRAMWAY RURAL, BUENOS AIRES.

After many years of successful operation the road was changed from animal to steam power. As the parlor and sleeping cars were still in good condition it was thought feasible to utilize these bodies. The way in which this was accomplished was most ingenious. The management sent to the makers of the cars to know if steam cars or platforms could not be built upon which the small horse car bodies might be carried, so that the old car could form the central section of a new eight-wheel steam car. The Brill Company replied that the scheme was perfectly practicable; the sleeper bodies could be placed at the center between kitchen and dining compartments; in the case of the parlor cars observation ends could be added. The platform and new ends

the old parlor car body. This car is 29 ft. 7 in. long and 7 ft. 11 in. wide over all; the height to the sills is 35 in. The observation ends are 5 ft. 4 in long, with platforms outside of these. At each end is a canopy supported by rods and brackets as shown. Brill gates are attached to the platforms

The work was all planned so that the car bodies fitted accurately in place, and the finish was accomplished by ordinary carpenters. Forms, templets and sizes are very carefully kept in the works, and there is no trouble in furnishing duplicate parts of anything that the company has ever built, or, as in this case, building new work which is expected to carefully match that which has been built years before.

## NOTICES TO THE PUBLIC IN STREET CARS.

## II.

In the REVIEW for November were shown the signs, posted in cars for notice to the public, which are used by some 20 companies. Herewith are shown the notices adopted by a number of other companies, including those in Chicago.

The Market Street Railway Company, San Francisco, posts a single card in each of its cars; the card is white, 21 in. long, the height varying somewhat for the different lines of the system. The notice is quite comprehensive; first come the usual cautions as to getting on and off the car when it is in motion, standing on the steps, and looking before crossing the tracks; next are the rules as to carrying luggage and bicycles, and rates of fare for children; following this orders of the Board of Supervisors, prohibiting spitting or throwing rubbish on the floor of the car are cited; next come the company's rules against begging, canvassing, etc., and the rule against undesirable passengers. Below this is a list of the transfers issued on the particular line, and this will be different for each line. At the bottom of the card is a line asking the public to co-operate in preventing abuses, and to report any cause for dissatisfaction with employes.

The sign for the Haight street lines, sent us by General Manager Vining, is reproduced herewith; in the original it is 9¾ in. high by 21 in. long.

This plan of posting a list of transfers issued is novel and can not fail to be greatly appreciated by the passengers who are comparative strangers in the city.

We doubtless all remember having read or heard that in certain localities of the United States various languages other than English are spoken to a great extent. In New Orleans, for instance, and in certain parts of Illinois, French is spoken in preference to English by a large portion of the population. On the southern border, more or less Spanish is to be heard, and none of us must go far to find a community which speaks German by preference; in Chicago notices to pay taxes are posted in German and English. But in most places every one understand English well enough to make it unnecessary for the street railways to print their announcements in more than one language.

<b>WARNING!</b>	<b>!AVISO!</b>
Persons riding on the steps or getting on or off the cars while same are in motion do so at their OWN RISK.	Toda persona que viaje en la escalera o que tome o abandone el carro estando este en movimiento lo hace bajo su responsabilidad.
<b>Consumers Electric Light &amp; Street Railroad Co.,</b> <small>CHESTER W. CHAPIN, Receiver.</small>	

<b>NOTICE!</b>
Passengers must not put their feet on the seats nor spit upon the floor of this car. Smoking allowed in rear of car only.
C. E. L. & St. R. R. Co.

<b>AVISO!</b>
Solo se permite fumar en el ultimo departamento. No se permite escupir en el suelo, ni poner los pies en los asientos.
C. E. L. & St. R. R. Co.

TAMPA, FLA.

The notices posted in the cars of the Consumers' Electric Light & Street Railroad, and the Tampa Suburban Railroad Companies, of Tampa, Fla., copies of which have been sent us by the general manager, George D. Munsing, are therefore something of a novelty.

The notice as to boarding or leaving cars when in motion is printed in black ink on a green card 8 in. by 15 in., both the English and Spanish being on the one card. The notices as to

smoking, etc., in the two languages are on separate cards, 4 in. by 7½ in.; they are in black ink on blue cards.

E. E. Winters, superintendent of the Macon (Ga.) Consolidated Street Railroad Company, advises us that his company has but one card placed in its cars, and that is a small sign prohibiting spitting on the floor.

The Montgomery (Ala.) Street Railway posts a sign printed in black ink on a white card 19½ in. long by 9 in. high. It gives a list of six things, dangerous to the passengers, which they must not do, a notice as to dogs, and an announcement that the company will not be liable for injuries resulting from the violation of the rules. The card has a wide margin at the top and is trimmed at the corners, as shown herewith.

The principal signs placed in its cars by the Chicago City Railway are shown in the reproductions herewith. The first two shown are printed in black on white cards 20½ in. long by 6¾ in. high. The spitting notice shows white letters on a blue background; the card is 20¾ in. long by 11 in. high; this sign is furnished by the city and is displayed in all street cars in Chicago. The transfer notice is in blue on a white card of the same size; another to the same effect is printed on a strip 34½ in. long and 3¾ in. high for use where the space available in the cars is not large enough for the other sign.

The Metropolitan West Side Elevated Railway Company, of Chicago, has embodied all its advice to passengers in 12 sentences, which are printed on a card 22 in. long by 11 in. high, shown reduced. They comprise the usual cautions as to getting on and off the cars, rules as to disorderly persons and smoking, lost articles, and the courteous conduct of employes.

On the Calumet Electric Street Railway, General Manager Sloan posts two of the Board of Health spitting signs, before mentioned, in each car, and also has a sign of mahogany 36 in. long by 2 in. wide, moulded around the edges, on which is lettered in silver letter 1½ in. high: "Spitting on the floor not allowed." These latter are placed one on either side in the center of the car, over the windows.

C. Loomis Allen, acting general manager of the Syracuse (N. Y.) Rapid Transit Railway Company, sends us samples of the two signs shown, reduced, herewith, which are the only ones permitted in the cars of that company as notices, other than the advertising racks. Both of these notices are different from the great majority of the others that we have published in that they are printed on small cards. The one on spitting is in black, save the two words, "not" and "floor," on a card 6 in. wide by 8 in. high; these two words and the border are in red ink. The notice as to misuse of transfers is in black ink on a card 6 in. wide and 9 in. high.

The Toledo Traction Company lets almost all the space in its cars, that is available for displaying signs, to an advertising company, and for its own part has only one notice to the public which reads:

"Spitting on the floor of this car positively prohibited."

The words "spitting" and "prohibited" are in display type and "positively" is heavily underscored.

The North and West Chicago Street Railroads display no rules in their cars. The sides of the cars above the windows are occupied by advertisements, and in one end is a card furnished by the city, and signed by the health commissioner, prohibiting spitting on the floor.

The Wheeling (W. Va.) & Elm Grove Railroad recently changed to electricity, has found it necessary to order additional power-house machinery to meet the increased traffic.



**NOTICE!**

THE ATTENTION OF PASSENGERS IS CALLED TO THE PROVISIONS OF:

Sec. 619 ff, Penal Code State of New York.

ANY PERSON IN POSSESSION OF A TRANSFER REGULARLY ISSUED TO HIM OR HER, OR WHO SHALL HAVE OTHERWISE OBTAINED POSSESSION OF THE SAME, WHO SHALL SELL OR GIVE AWAY SAID TRANSFER TO A PERSON NOT ENTITLED THERETO AND ANY PERSON WHO SHALL HAVE RECEIVED A TRANSFER NOT REGULARLY ISSUED TO HIM OR HER AS A PASSENGER, WHO SHALL OFFER THE SAME FOR PASSAGE UPON ANY CAR OF THIS COMPANY, IS GUILTY OF A MISDEMEANOR AND SUBJECT TO A PENALTY OF \$500 OR IMPRISONMENT FOR ONE YEAR OR "BOTH."

Syracuse Rapid Transit Railway Company.

SYRACUSE, N. Y.

**PLEASE DO  
NOT SPIT  
UPON THE  
FLOOR!**

The above request is respectfully made in accordance with the following Ordinance adopted by the City Board of Health, May 11, 1897:-

"EXPECTORATING upon the floors of Public buildings and of STREET CARS and of Steamboats, and of all Public Places, is hereby FORBIDDEN, and officers in charge or control of all such Buildings, Cars, Boats, and Public Places, shall keep posted prominently and permanently in each Street Car, and in each Steamboat, and in each Public Place, a sufficient number of notices Forbidding Expectoration upon the Floors, and Owners or Janitors of such Buildings and Public Places, Conductors of Cars and Employees upon Steamboats shall call the attention of all violators of this Ordinance to such notices."

BY ORDER BOARD OF HEALTH.  
Syracuse, May 11, 1897.

SYRACUSE, N. Y.

THE METROPOLITAN WEST SIDE ELEVATED RAILROAD COMPANY.

**NOTICE TO PASSENGERS.**

- 1 Passengers must not cross the tracks
- 2 Passengers are forbidden to get on or off trains, or to stand upon car platforms, while trains are in motion.
- 3 They are cautioned against putting their heads or arms out of the car windows
- 4 They are cautioned against throwing anything from the car windows.
- 5 Disorderly or intoxicated persons will not be permitted on the premises or cars of this Company
- 6 Smoking will be permitted in smoking cars only
- 7 Articles found in Stations or on trains, by or delivered to Employees of this Company, may be redeemed upon identification at the Lost Property Room, at Nos. 258-260 Franklin Street.
- 8 Passengers finding such articles, are requested to hand them to Station or Trainmen, who will forward them to the proper office
- 9 Conductors and Trainmen must call the attention of passengers to these rules when necessary
- 10 Employees are required to be courteous in their treatment of passengers.
- 11 Passengers are requested to report to the office of the Company any rude treatment on the part of Employees, stating their names or badge numbers for the purpose of identification
- 12 Employees must give their names or badge numbers to passengers whenever requested

W. E. BAKER, General Manager

Nos. 258 and 260 Franklin St., Chicago May 1, 1895

METROPOLITAN ELEVATED, CHICAGO.

**PASSENGERS ARE NOTIFIED**

1. To take hold of the hand-rail in getting on or off the Car; to enter and pass out on the side of the Car nearest the sidewalk, not to enter or leave the Car until it is fully stopped, and NOT TO GET ON OR OFF the FRONT PLATFORM.
  2. No person Intoxicated, or otherwise Violating Public Decency, WILL BE ALLOWED ON THE CARS.
  3. All Bundles or Packages carried will be held in the hands, or on the lap of the passenger, or placed under the seat.
  4. Gentlemen will please not Smoke (except on front platform, when front doors and windows are closed); and will not spit on the floor or put their Feet on the Seats of the Car.
- CHICAGO CITY RAILWAY CO. April, 1891  
M. K. BOWEN, Sup't

**NOTICE**

Cars Will Stop for Passengers Only at NEAR CROSSWALK of Street Intersections, Except Where Signs are Placed at Farther Crosswalks and in Middle of Long Blocks.

Passengers are notified to enter and pass out on the side of the car nearest to sidewalk, not to get on or off car by way of front platform or until car is stopped. Bundles, packages, etc., must not be placed in aisle or on seats. No person intoxicated, or otherwise violating public decency, will be allowed on the cars. Smoking allowed ONLY on grip cars, front platform of closed cars and three rear seats of open cars. Passengers must not spit on the floor or put their feet on car seats.  
In effect January 1, 1896. CHICAGO CITY RAILWAY CO.

**NOTICE! PASSENGERS ARE PROHIBITED**

To stand or ride, or go on the front platform,  
To enter or leave the car by the front platform,  
To enter or leave the car while it is in motion,  
To ride upon the rear platform,  
To stand in the car when there is room to sit,  
To leave the car on the side next to the other track.  
**NO DOGS ALLOWED TO RIDE ON THE CARS!**

The Company will not be responsible for any injury resulting from the violation of these Rules. PASSENGERS are warning to STOP the car for the purpose of getting out, and when they do so and BE RESPONSIBLE OF THE LOSS OF THEIR TIME AND MONEY.

R. F. SCOTT, General Manager

MONTGOMERY, ALA.

**SPITTING ON THE FLOORS  
OF PUBLIC PLACES AND OF PUBLIC CONVEYANCES  
IS A NUISANCE  
IS FREQUENTLY A MEANS OF CONVEYING DISEASE.  
AND IS HEREBY FORBIDDEN**

BY ORDER OF THE DEPARTMENT OF HEALTH.  
WM. R. KERR, COMMISSIONER  
JANUARY 1, 1897.  
OFFENDERS AGAINST THIS ORDER ARE SUBJECT TO PROSECUTION UNDER SECTION 1693 OF THE MUNICIPAL CODE OF THE CITY OF CHICAGO.

**NOTICE TO PASSENGERS.**

**HAIGHT STREET LINE.**

TO AVOID ACCIDENTS PLEASE WAIT UNTIL CAR STOPS BEFORE GETTING ON OR OFF  
LOOK OUT FOR PASSING VEHICLES DO NOT STAND UPON THE STEPS  
Only small luggage may be taken free upon the cars of this Company; any excess, if taken, will be charged for. Bicycles that can be safely carried on the holders will be taken, at carrier's risk, for a special fare. No transfer tickets.  
FULL FARE will be charged for children FIVE years of age and over, and for younger children when occupying seats REQUIRED BY OTHER PASSENGERS. When TWO OR MORE children between 1 and 3 years of age are together, FARE WILL BE COLLECTED at the rate of ONE FARE.  
Orders Nos. 3023 and 3064 of the Board of Supervisors PROHIBIT EXPECTORATION upon Car Floors, and the throwing of Bananas and other objectionable articles. No baggage, save baggage, or sale of newspapers or other articles permitted.  
The strict cooperation of the public in the prevention of almost needless loss to the Company is solicited in liberal free transfer system. Be courteous to passengers, or persons under the influence of liquor, or suffering from contagious diseases, or otherwise objectionable, will be allowed to ride.

**TRANSFERS ISSUED.**

- |  |   |
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| <p><b>IN-BOUND CARS ISSUE AT</b></p> <ul style="list-style-type: none"> <li>Fillmore St. to north-bound Fillmore St. cars</li> <li>Orange St. to west-bound Valencia or Castro St. cars</li> <li>Park St. to north-bound Park St. cars</li> <li>Park St. to north-bound Park St. cars</li> <li>Powell St. to north-bound Powell St. cars</li> <li>Third St. to south-bound Third or Kentucky St. cars</li> </ul> | <p><b>OUT-BOUND CARS ISSUE AT</b></p> <ul style="list-style-type: none"> <li>Second St. to south-bound Street St. cars</li> <li>Port St. to west-bound Port St. cars</li> <li>Orange St. to west-bound Orange St. cars</li> <li>Third St. to south-bound Third or Kentucky St. cars</li> <li>Eleth St. to west-bound Eleth or O'Farrell and Fortia, Park &amp; O'Connell cars</li> <li>Powell St. to north-bound Powell St. cars</li> <li>Soldier St. to north-bound Third and Sixth St. cars</li> <li>Park St. to north-bound Park St. cars</li> <li>Market St. to north and west-bound Carl St. cars</li> <li>Hayden St. to west-bound Park &amp; O'Connell cars</li> </ul> |
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MARKET STREET RAILWAY, SAN FRANCISCO.

**TRANSFER SLIPS**

**WILL BE ISSUED**

ONLY ON REQUEST OF PASSENGERS

**AT TIME FARES ARE COLLECTED.**

In Effect August 1st, 1898. Chicago City Railway Co.

CHICAGO CITY RAILWAY.





On November 26 and 27 a severe storm swept over the eastern states and New England which caused a great deal of damage to shipping and to the property of telegraph, telephone and transportation companies in the east.

At midnight on the 26th the fall of snow in New York amounted to five inches. The snow was badly drifted in the country and the railroad cuts in New Jersey, Long Island and rural New York were quickly filled.

The suburban trolley lines were blocked in many places; Coney Island service was cut off at 4 p. m. and the cars on several of the Brooklyn lines were stopped about the same hour. A large force of men was kept at work on the Brooklyn Bridge, clearing the car tracks and roadways, but the car service was slow and the tracks badly congested at both ends during the hours of heavy traffic in the afternoon and evening.

The New York "Sun" of November 28 thus describes the situation on Long Island:

"Persons returning from Manhattan began filling the Long Island Railroad depot in Long Island City, while the overflow from the waiting room of the New York & Queens County electric railway sought shelter in the general offices. These latter became filled, and it was found necessary to open the offices of the general manager to accommodate the throngs. Women and children, with melting snow dripping from their garments, huddled in the waiting rooms, worn out and exhausted. At midnight no cars had been run on the electric railway for hours, and those that had started out when the storm began were blockaded. Sunday morning came, and for the time being the Raines law was forgotten along Borden avenue. Every saloon and hotel was filled with a grumbling crowd. In the Long Island Railroad depot persons unable to get to their homes found comfortable nooks and dozed the night away. Hundreds took the ferry back to New York in search of a resting place for the night.

"Not a wheel turned on the electric road from 10 o'clock Saturday evening until late last evening. More than 40 cars which had been caught in the storm were blockaded at different points along the road. All had passengers. Telephonic communication was interrupted, and it was impossible for the railroad managers in Long Island to find the whereabouts of the stranded cars. Two snow ploughs and two sweepers, sent out early in the evening, were lost. No trace of them was obtained until yesterday morning, when the ploughs were located in a drift near Newtown, with thirteen trolley cars. They were on the return trip from Flushing when they ran into a drift about 400 ft. long and 20 ft. deep in a cut. Here the ploughs became wedged fast. The passengers were made as comfortable as possible until the storm abated, when they were taken to nearby houses. At daylight several of the men on the cars floundered to Newtown village, and, hunting up a telephone, notified headquarters of their predicament. Then there were cars strung along Jackson and Steinway avenues as far as North Beach. They had been abandoned, and were almost hidden in snowdrifts. Several cars were abandoned on the Dutch Kills line, and the Ravenswood line didn't fare any better.

"Morning found the road snowed under from end to end. Snow ploughs and sweepers were lost somewhere along the line, and there was no means of reaching them. Finally, when the wind went down, exploring and relief expeditions were sent out. One party started for Blissville up Borden avenue. Late the night before a car crowded to the platforms had left the Hunter's Point terminal bound for Lutheran Cemetery, in Middle Village. As this line runs through a sparsely settled section, considerable apprehension was felt for the safety of the passengers on the crowded car.

"The exploring party didn't have far to go. They found the

car with several others stalled in a huge drift close to the approach to the drawbridge across Jack creek. Some of the passengers stayed aboard for the night, and others got off and made their way to shelter in Blissville. How they succeeded in reaching Blissville, about a mile distant, is not known. About midnight Councilman Joseph Cassidy and several friends started for their homes in Blissville in a closed carriage and were forced to return. The other stranded cars were found and then a hunt was made for laborers to aid in clearing the road and in digging out the blockaded ploughs and sweepers. A messenger sent to the Italian colony near Blissville returned with the information that the Italians declined to shovel snow."

At many other points the electric cars were stalled and the passengers spent the night in the car, electric heaters being used as the power and not cut off.

The following is a detailed statement from the New York "World" as to the time during which the various lines in New York (Manhattan) were forced to suspend operations:

Name of Line.	Power Used.	Suspended.	Hours Resumed.	Sus-pended.
Second avenue, underground electric	.....	11:00 p. m.	4:00 a. m.	5.00
Fourth avenue, underground electric	.....	12:00 p. m.	6:00 a. m.	6.00
Sixth avenue, underground electric	.....	10:30 p. m.	10:00 a. m.	11.30
Eighth avenue, underground electric	.....	10:00 p. m.	3:00 p. m.	17.00
Amsterdam avenue, underground electric	.....	9:00 p. m.	3:00 p. m.	18.00
Ninth avenue, horse	.....	9:00 p. m.	11:00 a. m.	14.00
Lexington avenue, cable	.....	10:30 p. m.	10:00 a. m.	11.30
Fulton street, horse	.....	10:00 p. m.	3:00 a. m.	5.00
Chambers street, horse	.....	1:00 a. m.	4:00 a. m.	3.00
Avenue B, horse	.....	1:00 a. m.	4:00 a. m.	3.00
Spring street, horse	.....	11:30 p. m.	4:00 a. m.	4.30
Grand street, horse	.....	9:00 p. m.	8:00 a. m.	11.00
Avenue C, horse	.....	11:00 p. m.	8:00 a. m.	9.00
Canal street, horse	.....	9:00 a. m.	6:00 a. m.	9.00
Bleecker street, horse	.....	12:00 Mid.	4:00 a. m.	4.00
Fourteenth street, horse	.....	12:00 Mid.	4:00 a. m.	4.00
Seventeenth street, horse	.....	10:30 p. m.	6:00 a. m.	7.30
Eighteenth street, horse	.....	10:30 p. m.	8:00 a. m.	10.00
Thirty-fourth street, horse	.....	2:00 a. m.	7:00 a. m.	5.00
Twenty-eighth street, horse	.....	11:30 p. m.	9:00 a. m.	10.00
Twenty-ninth street, horse	.....	11:00 p. m.	9:00 a. m.	10.00
Forty-second street, horse	.....	4:00 a. m.	8:00 a. m.	4.00
Fifty-ninth street, underground electric	.....	12:00 M.D.	8:00 a. m.	8.00
Eighty-sixth street, horse	.....	11:00 a. m.	8:00 a. m.	9.00
Boulevard, horse	.....	9:00 p. m.	3:00 p. m.	18.00
Belt line, horse	.....	10:00 p. m.	7:00 a. m.	9.00
Lenox avenue, electric	.....	10:00 p. m.	11:00 a. m.	13.00
Westchester, trolley	.....	11:00 p. m.	Not resumed.	
Mount Morris Crosstown, trolley	.....	5:00 a. m.	5:00 p. m.	12.00
Willis avenue, trolley	.....	11:00 p. m.	Not resumed.	
Fordham avenue, trolley	.....	11:00 p. m.	Not resumed.	

Every road in the borough of Manhattan, except the cable lines, was forced to suspend some time during the night.

Every effort was made to clear the lines and by midnight the Metropolitan Company had 3,000 men at work; in the borough of Bronx it had 1,500 more. President Vreeland was out all of Saturday night directing and encouraging his men.

F. D. Rounds, general superintendent of the Metropolitan Street Railway Company, is quoted as follows:

"We managed to keep the track reasonably clear of snow, too, but we had no way of freeing the rails from ice. It does not make any difference how much power you may have when you have a slippery rail. That was thoroughly established last night.

"When the power was applied the wheels simply whizzed around without biting the rail. It was the ice not the snow that did it. Whenever the power comes from the car itself there is in a case like this no use trying to move it.

"On the other hand, the cable cars were pulled along after a fashion, unless the snow actually blockaded them. The power in



this case is underneath the rail and the car can be made to move whether the wheels turn or not.

"The same is true with the horse-cars. I saw a car last night drawn by our horses over an uncleared track. The wheels slipped and the car slid. You couldn't tell whether it was on the track, but it went.

"The storm was, of course, a test which showed just what the underground electric system could accomplish, but I hardly think that it can truly be called a fair test, because such a storm as this does not come once in a decade. As a general thing, if the snow is wet when it falls it melts instead of freezing. In this particular instance several cars were actually frozen into the snow so that it became necessary to free them with a pick. You can't run an electric car of any kind on a get-there-anyway plan. Even steam would have done no good last night. Any style of car not drawn would have shared the same fate.

"Of course, this evil will be remedied in time. I can't say what we will do, as the matter has not come up for consideration. But there must be some way out. We are not one bit discouraged. In fact, we are a little proud of the way in which the blockade was handled.

"Our system showed its efficacy last night and today if it ever did. Just the moment it began to snow all the men not on duty reported for work and were sent out on the line. They did all kinds of work, from sweeping the track to running the sweepers. Every man in the employ of the company will be kept on duty until the cars are all running as usual if it takes a week."

The Third Avenue Company was the only line in New York which was not running its cars over an hour behind schedule time.

The city had not let the contracts for hauling away snow and, in consequence, the street department could do but little towards clearing the streets.

On some of the conduit lines there were brilliant electric displays, caused by the melting snow grounding the supply rails, with the result that a sheet of sparks sprang out of the conduit high into the air.

In Newark, N. J., there was four inches of snow before the sweepers were put in service, with the result that there was in consequence some demoralization of the traffic. The cars ran at infrequent intervals and were all crowded, notwithstanding the storm kept at home all people who were not forced to go out. All the North Jersey Traction Company's cars were running Sunday morning.

At Elizabeth electric traffic was blocked. A number of cars were stalled and the passengers remained in them all night. At Jersey City, Long Branch and Atlantic City, and on the interurban lines the same state of affairs existed.

All the New England railroads were more or less tied up during the night of the 26th and morning of the 27th. The train service in and about Boston was suspended. Dispatches from Boston stated that cars and snow ploughs alike were lined along the main street of the city for blocks, unable to move, while pedestrians plodded along, making the best of the unfavorable walking conditions. Then again the wind, which was, during the morning, a heavy gale, would often tip a man upside down. It was a common sight in the suburbs and in the side streets of the city to encounter people returning from church buried up to their waists.

Throughout Connecticut the storm was severe and seriously interfered with the railroad traffic. At Hartford trolley service was suspended during Sunday the 27th.

In Philadelphia the suburban trolley service was suspended in many places and was everywhere demoralized.

On its way east the storm passed Minneapolis among other points, and a stalled car is reported from that city. A car with 25 passengers was blocked on the Como interurban line, about 3 p. m., on November 21, and 25 persons were in the car for 22 hours.

We note in "Indian Engineering" that the question of tramways for Calcutta is not yet solved. The city is not willing to grant a franchise for more than 30 years, and the company with which it has been negotiating will not accept a grant for less than 42 years.

## IMPROVEMENTS IN ST. JOSEPH, MO.

The St. Joseph Railway, Light, Heat & Power Company conducts a business which comprises the various lines included in its title. Besides operating 32 miles of street railway the company furnishes electric current for incandescent and arc lamps, commercial power for motors to the extent of 600 h. p., and supplies exhaust steam for many buildings in the business district. The railway is now being put in shape to become one of the best in the country. Much of the track has been recently relaid and the power station is now being reconstructed.

A steel framed roof supported on independent steel pillars is being placed over the old power house, and as soon as it is completed the old one will be taken down. The power house will be of steel and brick and occupy a space of 90 by 150 ft. Besides the 150-h. p. and two 200-h. p. Armington & Sims horizontal cross-compound engines and one 800-h. p. vertical cross-compound engine already in service, a 1,200-h. p. vertical cross-compound engine, built by Williams & Todd, will be added. There are now in the boiler room five 212-h. p. and two 250-h. p. Babcock & Wilcox boilers equipped with American stokers. The generators consist of two 60-k. w. and four 100-k. w. Edison machines, and a 425-k. w. multipolar machine. An 800-k. w. generator will soon be installed. When the new power station is finished General Manager Van Brunt feels that his station machinery will prove very efficient and satisfactory. The work of rebuilding the power house and replacing the units is being done under the superintendency of C. E. Roehl.

The company's car barn is a large wooden building 180 by 200 ft. and is heated by steam. The carpenter shop occupies a space of 30 by 200 ft.; the machine shop, 20 by 80 ft.; the winding room and store room 40 by 40 ft., and the paint shop just completed, is 30 by 200 ft.

The railway system consists of 14 miles of double track and about four miles of single track. There are 12 grades, the maximum being 9½ per cent; 14 switches, home made, and 35 curves with a minimum radius of 30 ft. The railroad crossings were furnished by the Ajax Frog Company. On the portion of the track which is being relaid, heavy work is being put in on the curves, Johnson 90-lb. rails being used.

The trolley wire is all of No. 0 and this is supplemented by 20 miles of No. 0000 and five miles of 500,000 c. m. feeders. Cedar poles, 30 ft. in length with 8-in. tops are used. The rails are of three sizes: 4-in. 40-lb. T-rails, 6-in. 60-lb. and 7-in. 70-lb. Shanghai. The rails are 60 ft. long and laid on 6 by 8 in. by 7 ft. white oak ties spaced 2 ft. apart. Heavy fish plates with six 1-in. bolts connect the rail at the joints which are supported on steel plates covering two ties beneath. Atkinson bonds furnish the electrical connection.

The company owns 125 cars, 36 of which are open motor cars and 46 closed motor cars. There are 7, 8 and 10-bench open cars and 16, 18 and 20-ft. closed cars. The 20-ft. cars are each equipped with two 35-h. p. motors and the smaller cars with 27-h. p. motors. Home made electric heaters keep the cars warm in winter. Lewis & Fowler registers are now used but these are soon to be replaced by others.

The officers of the company are: E. H. Harriman, president; H. A. Schenck, secretary and treasurer; W. T. Van Brunt, general manager; J. H. Van Brunt, superintendent, and John Montgomery, chief engineer of the power station.

## LARGER CARS IN PHILADELPHIA.

It is announced by President Parsons, of the Union Traction Company, Philadelphia, that all lines will be equipped with larger cars to provide better accommodations for passengers. Some of the new double truck cars have been put in service, and it is expected that by January 1, 20 of them will be running on the 17th and 19th street lines.

The new cars are made out of the 18-ft. electric cars in use for some years past, which are cut in two diagonally, and a section 6 ft. long inserted. The new cars seat from 60 to 80 persons.

## FOREIGN FACTS.

A concession has been granted for building and operating a system of street railways in Lisbon, Portugal.

The Dublin Tramways Company is building a large power station at Ringsend and it is nearing completion.

The city council of Leeds has petitioned Parliament to grant powers to construct an interurban line from the city limits to Bradford.

The railway commissioners of Hungary are considering a project of building an electric line 35 miles long connecting the towns of Arad and Temesvar.

An experimental storage battery line is being built between Milan and Monza, Italy. Contracts have been let for the batteries, motors and controllers for two cars.

The Redditch (Eng.) District Electric Traction Company has applied for permission to construct an electric line from Redditch to Astwood Bank, a distance of three miles.

The municipal tramways of Dover, built by Dick, Kerr & Co., have been successful financially during the past year. After paying operating and fixed charges a balance of \$6,500 remained.

The Halifax Tramways Company is in need of more rolling stock and an order of over \$17,000 for trucks and electrical equipment has been placed with the Westinghouse Electric Company, Limited.

In accordance with instructions from the city council the city engineer of Liverpool has prepared plans for electric lines which will have a total length of 18½ miles and the estimated cost will be \$455,000.

A tramway syndicate has been formed in Brussels with a capital of \$300,000, which was subscribed by Belgian and French bankers. Electric railways will be promoted in various cities on the continent.

The corporation of Oldham, England, is preparing plans for an electric line for the city and suburbs. Some of the track has been laid and poles for the overhead wire have been erected along a part of one route.

The electric railway systems of the Isle of Man have closed a prosperous season. The line between Laxey and Ramsey will be double tracked. The Snaefell mountain railway line has been liberally patronized during the pleasure season.

The British Electric Traction Company is equipping some of the tramway lines in Dudley for electric traction. The steam road between Dudley, Sedgley and Wolverhampton will have its rolling stock and line changed for operation by the trolley.

Plans are nearing completion both by the British Electric Traction Company and the corporation of Dewsbury to construct a system of electric lines in the towns and districts of Heckmondwike and Ravensthorpe, which have a population in excess of 100,000.

Satisfactory progress is being made on the construction of the trolley lines in Kingston, Jamaica. Most of the work is being done by native labor, and the West India Electric Company is in hopes that the natives can be educated for motormen and conductors.

Many applications are being made for franchises to construct street railways in Buenos Aires, which is the largest and most progressive city in South America. The city council is disposed to sell the concessions to the highest bidder and insist on immediate construction.

The tramways of Barcelona and Madrid, which have been under construction by Dick, Kerr & Co., are now completed. The first official trip on the trolley cars of Madrid was taken October 3, and in Barcelona, November 9, but they will not be opened for traffic until January 1.

The first section of the Liverpool, Eng., electric road, about 2½ miles long, was opened November 14, and was liberally patronized. The plan of stopping at certain points only, about 600 feet apart, has been adopted; at four of these points the cars always stop, at intermediate points the stops are made only to take up or discharge passengers.

Water power development is having a boom in Italy and consequently this cheap power has been an inducement to project electric railways. An electric line is being built in Naples and it is believed that it is the first step in the complete conversion of the whole system. A company has been formed in Turin to build a road between Varallo and Aragna.

The tramways committee of Manchester, after visitations to Liverpool, Dublin and Hamburg, has recommended to the city to take prompt action for changing the railway lines for electric traction. The single deck, central opening cars, such as were built by J. G. Brill for Liverpool, were in the opinion of the committee best suited for traffic in that city.

The British Electric Traction Company is very active in seeking concessions and in a few years will be in possession of many valuable electric railway properties. The company has made application for concessions for an electric traction system in Colechester, an interurban line between Airdrie and Coatbridge, one connecting several towns in the Spen valley and one connecting the towns between and about Dudley and Sedgley.

The electric line connecting Berlin with Zehlendorf, 7½ miles apart, is now in operation, and the trip is made in 27 minutes. A motor car is attached to the front and rear of each train of nine cars and in this way switching the cars at the terminals is avoided. Each motor car is equipped with two 100-h. p. motors and these are connected electrically. Both electric and Westinghouse air brakes are employed. The cars take current from a third-rail at 550 volts.

The first step towards the adoption of electric traction for the Metropolitan and Metropolitan District Railways, of London, has been made. A short section of track, having the steepest grades, has been selected for an electrical equipment, and the contracts for power station machinery and motors have been let. This preliminary work will be completed by next summer, and it is confidently expected that after a satisfactory trial all the steam locomotives will be superseded by electric cars on the underground lines.

The experimental electric line of the Glasgow municipal tramways is largely equipped with American machinery. The overhead and line work were done by representatives of the Westinghouse Electric Company, of London. The three engines were made by McIntosh & Seymour and are the horizontal, tandem compound type, direct connected to Westinghouse generators. The motors and controllers are also of Westinghouse make and the switchboard instruments are from the Weston Electrical Instrument Company.

Japan is now being recognized as a promising field for the trolley car. There are numerous large cities whose business and population is increasing rapidly. There are only two systems of any importance now in the country; a horse car line in Tokio, established in 1882, and the trolley lines in Kioto. A committee on railways has been appointed by the government, and this committee has sent a representative to inspect the street railway systems of America and Europe before any extensive franchises are to be granted. It is expected that an American syndicate has been formed to secure franchises and build electric lines in several of the most prominent cities.



## CAR FOR THE SCHUYLKILL ELECTRIC RAILWAY.

The accompanying illustrations show two views of a new car built for the Schuylkill Electric Railway Company, of Pottsville, Pa., by the J. G. Brill Company. For summer the sides of the car are filled with gratings as shown in the first view; and for winter sash with glass are used.

The body is 30 ft. 6 in. long, and the width over all 8 ft.; at the sills the width is 7 ft. 6 in. The platforms, which are completely enclosed with vestibules having folding doors, are 4 ft. 6 in. long. The length of the car over all is 40 ft. 6 in.

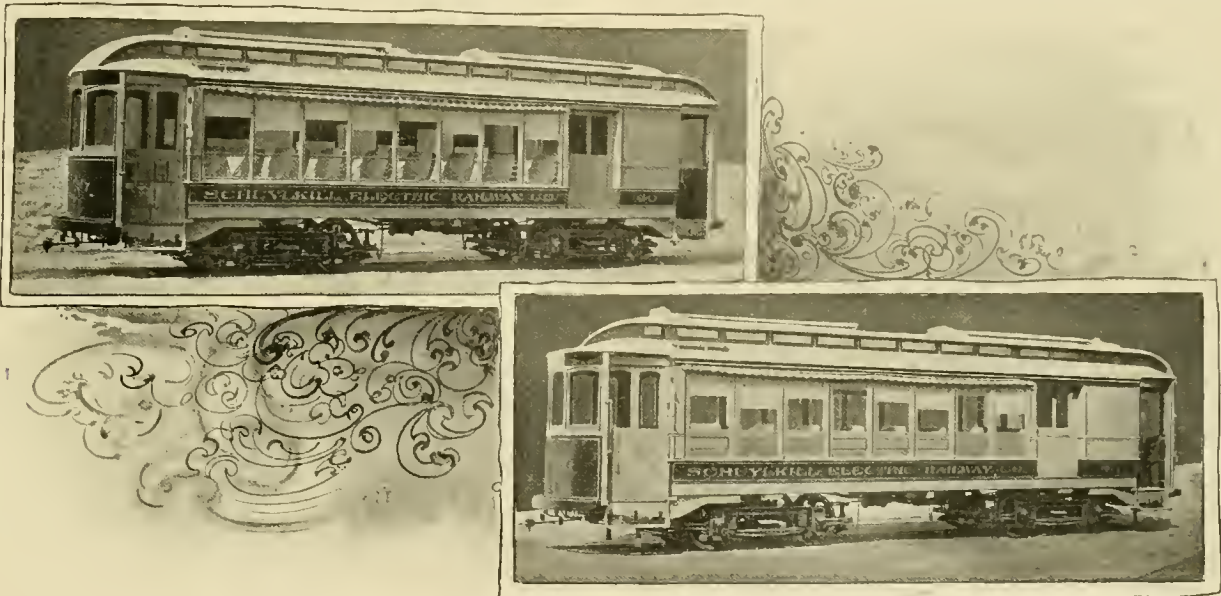
The car is mounted on Brill No. 27 "Perfect" trucks, of 5 ft. 9 in. wheel base, and is equipped with air brakes. The wheels are 33 in. in diameter. There are two motors of 27 h. p. each. The car practically presents all the conveniences of a steam train, excepting only that of a toilet room. It has a first-class passenger compartment and also a baggage compartment 8 ft. 4 in. long, which can be used for smoking, as there are folding seats at the sides. The car is furnished with Brill's angle iron bumpers, bronze metal trimmings, bronze grab handles and brake handles, and has solid glass in the sash in the vestibules. The

two telephone companies in the city suffering a loss of \$10,000, and the telegraph lines were useless for nearly 24 hours.

After the sleet has formed on the wire, about 6 a. m., it was observed that the weight of ice was nearly 20 times the weight of the wire, indicating the great tensile strength of the metal. The ice, instead of forming on the side from which the storm came, as is usual, formed all round the wire, and pendant from the bottom at intervals of ½ in. were icicles, some 3 in. long. The combined weight of these loaded wires was too much for the poles when a strong wind came from the north. The breaking poles, the wires snapping, the crash of the falling mass, together with noise of falling trees, crushed by their load of ice, made a fearful din.

So dangerous was the mass of broken and tangled wires that the chief of police ordered all power stations shut down. The electric cars were dead just where they happened to be at the time and remained in the streets for 24 hours. The crews spent the day and night on the cars and the citizens attended to their wants by bringing warm food, cigars, etc., to keep them comfortable.

When the current was turned on next day there were many mishaps, but none serious. There were delays until broken telephone poles could be taken from the track, many fuses were



BRILL CAR FOR SCHUYLKILL ELECTRIC RAILWAY.

doors in the partition between the passenger and baggage compartments were fitted with a steam car stop. There are the usual spring roller curtains at the windows and also an outside curtain for storm use. The bulkhead between the compartments has glass doors swinging into the passenger end; the sliding doors on the sides of the baggage compartment are 3 ft. 6 in. wide, with safety chains for use when the doors are open. There are double trolley boards with the trolley pole located over the centre of each truck. Hooks are provided to hold down the pole when the other one is in use. The side sills are sheathed with steel. The seats and backs were covered with woven rattan.

## A DESTRUCTIVE SLEET STORM IN KANSAS.

A sleet storm beginning at 4 a. m. on November 21, proved to be one of the most destructive that ever visited Leavenworth, Kan., effectually preventing the operation of the cars of the Leavenworth Electric Railroad Company, leaving the business portion of the city in total darkness at night and cutting off most of the telephone service, including the fire department and police headquarters. Fully 400 miles of wires were down, each of the

burned out and one car jumped the track and ran onto the sidewalk. There was not one trolley wire broken and with all the wires down there was not a single accident from electricity.

## REORGANIZATION AT KOKOMO, IND.

On November 12, Fremont Woodruff, of Detroit, acting as trustee for W. H. Stevens, of Detroit, purchased the property of the Citizens' Light & Power Company, of Kokomo, Ind., at receiver's sale. The price paid was \$24,000. This company will be consolidated with the Kokomo City Street Railway Company, and known as the Kokomo Street Railway, Light & Power Company.

Contracts have been let for three 250-h. p. Stirling water-tube boilers, and for a 500-h. p. cross-compound Russell engine, the latter to the Arbuckle-Ryan Company, of Toledo. In the early spring one mile of new track will be laid and four new cars and equipments added. The company now has 6 miles of track, 10 motor and 5 trail cars.

The officers are: W. H. Stevens, president; Fremont Woodruff, trustee; W. P. Stevens, secretary and treasurer; C. L. Harry, manager and purchasing agent; M. L. Harry, superintendent. Gilbert Wilkes, of Detroit, is consulting engineer, and G. W. Calkins, engineer of the power station.

## PRACTICAL POINTS IN STREET RAILWAY ENGINEERING.

Read before the Chicago Electrical Association by W. A. Harding, master mechanic of the Calumet Electric Street Railway.

It was suggested to me that rather than present to you a paper full of data, etc., that I should call your attention to the different points of interest and problems that are met with in practical street railway work, so you could start a discussion and give to each other your personal experiences.

First, I must call your attention to the fact that it is impossible to make any arbitrary laws for the conduct and management of street railway property, conditions altering under various circumstances; financial conditions, condition of travel, nature of ground, locality, speed and climatic conditions, all require different managements and different problems to solve.

A road running through a very thickly populated district with good roads, etc., has the cost of operation at a minimum and can afford to spend a few thousand dollars to raise low joints, put in plenty of feed wires and keep cars well painted.

But take a road running out far into the suburbs and sparsely settled districts; to put up feed wire, keep up voltage as it ought to be and to raise low joints would bankrupt the company, and as for painting cars, it is out of the question. Many a country road runs through marshy land, making low joints the rule. The mud and water may be thrown all over the cars, and if this is of an alkaline nature, you can easily see what becomes of your paint. Motors that under ordinary conditions are called water tight will here fill with water unless extreme measures are taken to provide against it.

The choosing of a suitable car and equipment in the past consisted of buying car, truck and motor, without any reference as to their suitability to each other, and car or truck would have to be rebuilt to fit. I remember a company that bought long 36-ft. combination cars, closed in the center and open, with seats, at each end, having two massive four-wheel center pivot trucks, and put in two 15-h. p. motors. Grades were from 3 to 12 per cent. It was only a short time before the motors were completely roasted. The company then went to the expense of cutting the body down to two-thirds size, taking one truck and lengthening out to 7 ft. and putting in two 15-h. p. motors. The equipment now ran very satisfactorily, but owing to poor construction of the car body, they would "hog-back" in a very short time, necessitating constant renewals of subsills, etc.

Now what cars shall we use? Take a supposed case. For winter the public demands a five-minute schedule and the average load is from 25 to 35 people, during rush hours say 100 people per load. We do not want to haul around a large car empty half the day, so we will put on a 22-ft. car as large as is advisable for a single truck, with two motors and large and roomy platforms; if in a cold climate, preferably vestibuled. Now if the cars should be a little crowded, the platform would always accommodate a few. When the rush comes on one or two trailers could be added for a few hours. If quickness and dispatch in unloading are not the predominating features, or too many transient passengers, a large double truck trailer car is in my mind much the better. They are easier for motormen to handle than two single truck cars, easier to ride, easier on the track joints, require one conductor in place of two and can make much faster time.

During the summer the same rule applies, except that when the climate allows, open 10-bench cars should replace the closed ones. If travel warrants it, there is still a better field for larger cars (which have side entrances) making less units.

Now in the suburban districts sometimes the smaller cars will not accommodate your passengers and yet say you cannot afford to put on more cars. Now you can use your large cars to advantage. In fact, you can sum up the whole problem as follows: Use the largest seating capacity cars, that a satisfactory schedule will warrant. For suburban travel where speed is the main point, double trucks having four motors can be run faster than single trucks with less wear and tear on equipment, track and passengers.

As to trucks. They should be built with the side bar in one piece having no bolts or rivets, except where the cross braces for hanging brakes are placed. Brake shoes should not be hung on links, but in such a way that they cannot kick and will take up their own wear. An average wheel base of 8 ft. is proper for single trucks when under a 22-ft. closed body, or 10-seat open bench-car. Springs should be graduated to allow the car to ride easily without undue oscillation. The same rule applies to tracks for double equipment, only the wheel base should be as short as the motor truck will allow, also allowing for the car to oscillate sideways.

The motors should be carefully chosen for the work to be done. A powerful motor if put under a light car hauling trailer, will slip the wheels on the track and the car will not make sufficient speed; but if car body, trucks and motor are of sufficient weight to get the best traction, the train will now make faster time. The bearings of the armature should be large and fed from below with wick feed from oil, with box above to hold wool waste with additional oil in place of the usual plan of dope. Such bearings should be built outside of the motor frame and also protected by large circular disks to prevent the oil from working into the motor.

The commutator should be made of good drop forged copper bars, the diameter to be as large as possible. In our motors we use a bar  $1\frac{1}{2}$  in. high. By using soft amber mica between the bars, the commutator wears smooth and keeps it polished. The number of slots in the armature should be kept as low as possible, it being cheaper to make repairs when four to six coils can be put into one slot; also coils should be machine wound, a thing not possible with all our armatures now.

A motor, if carefully kept clean, the brushes properly treated and changed each night and not abused unnecessarily by the crew, will last without rewinding for from four to five years, and even longer. With proper attention to brushes, commutators of the modern type should wear not more than  $\frac{1}{8}$  in. per year.

It will take too long to go into track and line construction in this paper, but I will just touch on a few points.

Figs. 1 and 2 show the single and double pull-offs which are standard on the lines of the Calumet Electric Street Railway Company. The castings are made extra heavy, with a broad easy curve under the arms to prevent the trolley harp catching or binding. An ordinary machine bolt or tap screw holds the clinch ear, and a wooden strain insulator of the old Edison type is attached for the span wire, doing away with the present plan of bell-hangers and insulated studs on curves. So far the company has been unable to find an insulated stud which would not crush and eventually ground on the span wire.

Fig. 3 is a section of a straight line hanger which is now in service. The wooden bushings in the hangers have held up so far against the crushing stress on the straight line work. The bushing has a large bearing surface and is self-tightening, which prevents chafing. The wooden cap on top acts as an insulated washer between the bolt and cap. The object of so many legs on the cap is that while only two or three are to be used at a time, if they should break off in being pried open for repairs, there will be several in reserve.

Fig. 4 shows types of strain insulators made of wood. All the wooden insulation is soaked in petroleum until it is thoroughly permeated with it and then the wood is boiled in paraffine wax and afterwards coated with a weather-proof paint. The wooden plugs cost 1-3 cents for renewals.

The line circuit breakers, cross-overs, both live and insulated, wherever possible are made to be underrunning, and so that all insulated parts, whether of wood or fiber, will fit in at their full size without having to be shaped or beveled in any manner. An example of this is the straight line circuit breaker with a piece of fiber or wood  $\frac{3}{4}$  in. thick, 4 in. wide and 12 in. long between two brass terminals. The wood or fiber fits squarely between the lips of the terminals without any cutting. When completed the square edges on the lower side are ground off on an emery wheel to fit the trolley wheel. All the frogs and switches used by the company have exceptionally long flexible ears.

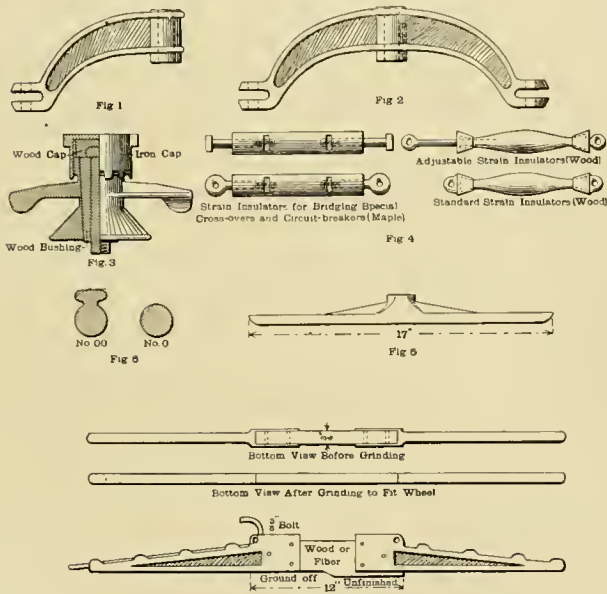
The clinch ear, represented by Fig. 5, is 17 in. long. At the center, where it is held by a bolt, the section is wedge-shape



to conform to the shape of the trolley wheel, and the ear tapers off 8½ in. on either side, giving great flexibility. The past experience has been that the trolley wire has frequently been broken off sharply at the end of the line hanger. By using this clinch ear this trouble has been obviated and the line has greater flexibility. Owing to the shape of the hub it is possible to cast four in a gate, and these can be lifted from the sand vertically, doing away with the expense of sand cores. By this method the culls from the brass foundry have been reduced to a minimum, as the metal runs much freer and always having a downward flow. The bell hangers and the clinch ears just described were designed by H. M. Sloan, general manager of the company.

In Fig. 6 is given the outline of section of trolley wire which has recently been designed. The periphery of the bottom section is exactly the same as a No. 0 wire and the area of the cross section is equal to No. 00 wire. Fig. 8, No. 000 wire, has been tried, but it proved too heavy and the upper part was considered poor shape for a clinch ear.

A kind of natural rheostat has been devised for absorbing from

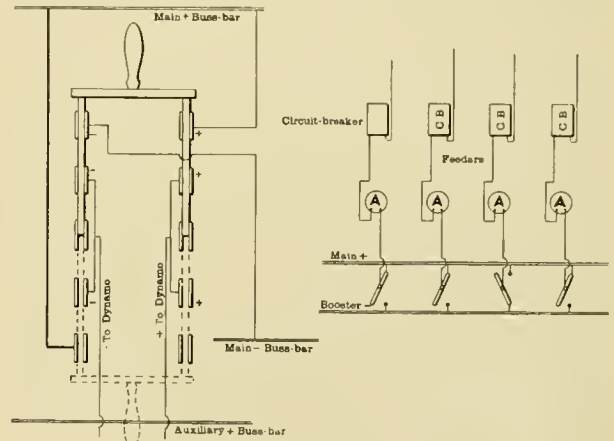


200 to 1,000 amperes in testing the generators or other station machinery. At the rear of the power house is a piece of swampy land. Four 2-in. pipes were driven from 5 to 6 ft. into the ground and a piece of horse car rail, 30 ft. in length, was partly submerged in the water and mud. A shallow ditch, about 12 in. deep and 12 ft. long, was dug and the water allowed to enter. Over this was suspended a T-rail on blocks.

These rails were connected by copper wire which extended to a feeder tower near by and tapped into a spare feeder. This feeder entered the station and could be switched into the auxiliary bus-bar, as indicated in the diagram, Fig. 7. When making a test the load was thrown on the auxiliary bus-bar, and by raising or lowering the rail in or out of the water in the ditch the current could be regulated within one ampere. A load of 500 amperes running continuously for five hours increased but five amperes. The same means was used for testing the station wattmeter and other instruments.

How are we to get the voltage raised at a distant point of the line where it is required for only a few weeks in a year? The cost to install a storage battery or booster, or to put up more wire, is all out of proportion to the returns. Take one of your dynamos with a capacity equal to the load demanded at this particular point. Change your two switches to double throw. When thrown up all connections are for running as a dynamo on the switchboard in the usual way. By throwing blades down, the + of machine is thrown onto an auxiliary bus bar and the - onto the positive main at the switchboard, making this particular dynamo in series with the station. The equalizing switch is left

open; the field wires are not altered. The dynamo is now run at whatever voltage you need, may be 200 or 300. The feeder that goes out to the point of the line where you wish voltage



SWITCHES FOR BOOSTER.

raised is now thrown onto this booster, as we must now call it. Again, if the feeders are properly adjusted, a switch and fuse can be put in between the circuit breakers of several sections and a whole district raised in voltage, if only for a few hours during rush time. As the station usually holds a reserve unit, there is no additional outlay or expense needed. In case of a breakdown or disabled generating unit, the boosting would be discontinued until such time as repairs were made.

Accumulator traction has greatly improved. Batteries are more durable and it certainly has a future of its own. Cars running without interference from outward sources or with each other cannot be overlooked, but I think they are not generally suitable, for the expense of changing batteries on all the outlying districts of a large system would be enormous. A few of the disadvantages are increased weight of car; an expensive road-bed; depreciation of the batteries, and difficulty of recharging under all conditions.

I was asked the comparative cost of operating different systems of street railway and will quote from the report of H. H. Vreeland, president of the Metropolitan, New York, the following statement:

- Expense of operating horse cars... 17.87 cents per mile.
- Expense of operating cable cars... 16.12 cents per mile.
- Expense of operating electric cars... 10.23 cents per mile.

In each case conditions were equally favorable for the system used.

## NORTH CHICAGO PRIZES.

A number of years ago three prizes were offered to gripmen on the North Chicago Railroad showing the best record for a year. So many were found to have nearly perfect records that the number of prizes was increased. November 29, the annual distribution of prizes took place. Thirty-three men received prizes; 10 with perfect records received \$70 each; six received \$35 each, and 17 received \$20 each. The total of the prizes was \$1,250.

The record is made up from the reports of the superintendents of the various lines and includes such items as carefulness, running trains smoothly and on time, freedom from accidents, and politeness to the public. The records of the claims department and the report from the public of complaints are also matters which the prize-competing gripman has to bear in mind.

The Heilmann locomotive is again receiving attention in France; a new and improved arrangement of engines and generators has been made on the ponderous machine. The Heilmann Company has been formed in Paris to promote the patents of J. J. Heilmann and to carry on business in France and colonies in all kinds of traction and electrical machinery.

## FRANCHISE FIGHT IN CHICAGO.

There is now pending in the city council of Chicago an ordinance providing for an extension of the street railway franchises for 50 years, in accordance with the Allen law, passed at the last session of the Illinois legislature. This law (see REVIEW for June, 1897, page 408), has been made the object of concerted attack by all save one of the Chicago newspapers, and by almost everyone else with a political axe to grind.

No prediction can be made at this time as to the ultimate outcome. The following extracts from the daily press will serve to show the means employed by the opponents of the measure.

The "Chicago Record" of December 9, published an article on "Street Railway Expenses" which was signed by William Ritchie, from which the following technical gems are extracted:

"Steam generated by coal by present methods wastes more than 90 per cent of the energy of the theoretically possible power contained in coal. Within the last two years Dr. Jaques, of Boston, has invented a process of generating electricity directly from the coal, by which he is able to utilize over ten times the amount of possible energy stored in the coal beyond what is now available. (See Harper's Monthly Magazine for December, 1896.)"

"By a simple invention for electrically welding the joints of rails, the companies within the last few years, in the mere item of repairing rail joints, have effected a saving amounting to 80 cents per year for each joint. (See Mr. M. K. Bowen's article in STREET RAILWAY REVIEW for January, 1896.)" [Mr. Bowen had no article in the number of the REVIEW cited, and so far as we are aware, has never published in the REVIEW any statement that could by any process be tortured into the meaning quoted.—Ed. REVIEW.]

The avowed object of the Mr. Ritchie was to show how greatly the operating expenses of street railways had been reduced, and therefore a 5-cent fare had become exorbitant. We trust that our readers will at once avail themselves of the information above given, if it should happen that they have not yet commenced to use Dr. Jaques' "process" in their power houses.

## CHOICE NEWSPAPER EXTRACTS.

Democrats of the eighth ward were also in favor of violence if necessary. One clause of the resolutions passed was as follows:

"Resolved, that this club assist in any summary proceedings to be dealt out to any alderman voting for franchises without just compensation to the city."

Many democrats at the meeting in the 18th ward declared that a mob of men would go from the ward next Monday night to the council chamber and insist that the two representatives of the ward vote "right."

"And if they don't we will help tear down the city hall, I can tell you," said one of the committee of ten.

\* \* \*

Noose badges became numerous yesterday. They are made of black satin and contain a picture of a gallows, with a noose depending from its projecting arm. Each badge is accompanied by a black pin, which is to be employed to attach it to the coat.

\* \* \*

Toward the close of the meeting [of the Monticello club] Judge Tuley arose.

"I had not intended to make any speech," he said, "but there is one clause in these resolutions that this club as a law-abiding organization cannot afford to pass. This resolution calling for a personal escort for each alderman of 2,000 citizens in the event of an obnoxious ordinance being passed is a direct incitation to mob violence. I move in amendment that it be stricken out."

This precipitated a heated discussion. Charles Shackelford took issue with Judge Tuley and said the difficulties in obtaining technical proof of bribery for legal conviction of bribers made stronger measures necessary. He said: "In a certain county in Missouri a gathering of outraged farmers hung the judge, the sheriff and other county officials, who had been parties to a fraudulent issue of bonds. There has never been a fraudulent bond issue in that county since. I am opposed to mob law, but there are occasions in the history of every community when appeals to moral sense are in vain."

\* \* \*

WANTED—10,000 strong-limbed and fearless men. Apply at the council chamber, with ropes, the night the aldermen attempt

to pass the 50-year franchise robbery. Come prepared to do business.

\* \* \*

"It is not idle talk at all, and I shall not be surprised to see some hanging done in the streets of Chicago. I don't mind saying, too, that I shall not send in a riot call when it starts."—The Mayor.

The Inter Ocean, December 10, 1898:

New York, Dec. 9.—The Journal prints the following from Charles T. Yerkes:

"The street railroad companies' charters extend to 1957. The city claims, however, that the ordinance giving the companies the right to have the tracks on some streets expires in 1903. To settle all differences in regard to this matter, the street car companies have been working for over a year to arrive at some conclusion which would be fair to the city and street car companies. The mayor has refused to meet the officers of the street car companies, claiming that he would not do so, and would only consider the matter when the ordinances came before the city council. The street car companies have introduced an ordinance wherein it is asked that the franchises be extended for a period of 50 years, the rate of fare to remain as it now is for 20 years, at the expiration of which time the fare is to be readjusted.

"The officers of the street car companies have done everything in their power to bring about a proper understanding between the city authorities and their companies, but owing to the action taken by some of the newspapers in Chicago, the efforts up to the present time have been of no avail.

"The fact is that there is a combination of newspapers in Chicago which levy blackmail on any corporation which they can force to pay tribute. The Chicago Tribune, the Chicago Record, and the Daily News are conspicuous in this business. The proprietors of those papers have agents who make demands on the corporations. Demands have been made on the traction companies, which have been refused, and which will continue to be refused.

"I know what I am saying when I give you these facts, and know that what I say to you is libelous and I am liable to an action for slander. I wish to say that I defy the proprietors of those papers to bring such an action against me, and there is nothing which would please me more than to have them do so and give me an opportunity to appear in court and expose their nefarious schemes.

"It is also a fact that there has been an arrangement made between these newspaper people and Mayor Harrison, to the effect that if he will prevent the traction companies from obtaining the extension ordinance, they will favor him for mayor at the next election and also for governor in 1900.

"This whole excitement is brought about for the purpose of driving the traction companies to settle with these blackmailing newspapers. The New York traction companies have perpetual franchises, and can therefore afford to make improvements of a kind which are of great advantage to the city. The roads in Chicago have improvements as good, and I think better advantages for carrying people than in New York. The only advantage which New York now has is in the underground system of electricity. This cannot be used in Chicago on account of the inadequate drainage owing to the city being perfectly level and the fact that whenever there is a heavy rain the sewers are overflowed.

"The street railroad companies offer the city for the extension of the ordinance 3 per cent of their gross receipts. I suppose as long as the traction companies refuse to pay tribute to the principal newspaper managers they will endeavor to keep the people in a state of excitement.

"I don't think the Times-Herald is in the blackmailing combination, except indirectly. The proprietor of that paper is completely dominated by Victor Lawson, the proprietor of the Chicago Record, which explains the fact of the Times-Herald taking a leading part in producing the excitement.

(Signed) "Charles T. Yerkes."

Practically the whole trouble grows out of political and personal motives. The Allen bill is anything but the "vicious" enactment the daily papers would make it. The street railways simply refused to be held up, and the combination of Chicago dailies were thereby incensed and have been raging ever since. It is a noteworthy fact that not one of these dailies which so



bitterly resent the Allen bill have ever published it. Not one person out of 500 who thinks the Allen bill a bad measure has ever read it or could tell anything about it beyond the fact that it permits the granting of a 50-year franchise. What they do not know and what the papers steadily conceal is the fact that it actually places no limit on the percentage which granting bodies may exact.

The same session which passed the Allen bill enacted a gas bill which was much worse than the papers try to distort the Allen bill into being, but not one word is ever heard about that. Business and thinking men are simply disgusted at the unconcealed animus of the whole affair.

The political features of the whole thing centers in the mayor of the city, who has other ambitions, and who has selected the street railways as the most conspicuous object on which to make his grand stand play. Political organizations, ward clubs, and the entire local party machinery have been enlisted in the work of opposing the companies and advancing the personal political interests of the mayor.

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### NEW PUBLICATIONS.

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The "Electrical Era" is the name of a new electrical monthly published in St. Louis which makes its bow to the public with the December issue, which comprises 34 pages of interesting matter. A. S. Rivet is editor and proprietor. Our new brother believes that St. Louis presents a field for an electrical trade paper and proposes to fill it. As all electrical prices are down to bed rock, Mr. Rivet thinks the price of newspapers should also be low, and has placed that of his at 3 cents per number or 25 cents per year.

In Catalog V of the Electric Storage Battery Company special types of "Chloride" accumulators for electric vehicles are described and illustrated, with sizes of plates and price lists given. This company has been fortunate in securing the basic patents and patent rights underlying the manufacture of the important types of storage batteries. The company is also allied with the largest makers of storage batteries in England, France and Germany, whereby the company secures the benefits of the improvements in all these countries.

On December 1 the "Daily Tribune," of Austin, Texas, published an edition of 20 pages, in which were described the business institutions of the city, with numerous half-tone illustrations. Of the street railways it says: The city has 16 miles of street railway. Of these 13 are operated by the Austin Rapid Transit Railway, and three by the Dam & Suburban Railway Company, the latter extending to the dam. Both are under enterprising managements, give efficient service and furnish pleasure-lovers with summer attractions at the pavilions located at their termini.

Commercial Cuba is the appropriate title of the attractive volume of over 500 pages just from the press of Charles Scribner's Sons. Aside from the value which the work, at this time particularly, has for business men and general readers, additional interest pertains to it among the street railway fraternity on account of the author being William J. Clark, manager of the street railway department of the General Electric Company. We all knew Mr. Clark writes with a ready pen, from the numerous papers he has contributed to the various street railway association meetings, but in this instance he has written along other than technical lines, and with a completeness and grace which fills every page with interest. It is doubtful if any other was as well equipped from long and careful study and observation of Cuban life and customs to undertake this work as Mr. Clark. The book opens with a chapter on Cuban social and business etiquette, and fully describes along what lines the foreigner must travel if he hopes to lead up to business negotiations. What not to do seems to overshadow the things which one must do. Succeeding chapters speak of the population, climate, preservation of health, geography, transportation, currency and banking, legal

systems, past and future, animal and vegetable life, and a description of each of the leading cities and provinces.

In short, the work is a strictly up-to-date encyclopedia of Cuba, and will be read with equal interest and profit by those who contemplate commercial enterprises there, and those who desire to inform themselves on a subject which until now has offered little opportunity to study intelligently. The book is fully and handsomely illustrated and contains numerous maps. Price, \$4. Scribner Sons' Company, New York; and all booksellers.

"La Traction Electrique," by André Blondel, engineer of roads and bridges, professor of applied electricity in the School of Roads and Bridges, and F. Paul-Dubois, engineer of roads and bridges, of the Municipal Service of Paris, is a work in two volumes, comprising over 1,700 pages copiously illustrated with 1,000 cuts, published by Bandry & Co., Paris.

The work is a complete treatise in which has been collected all the information upon the subject of electric traction upon metal ways (exclusive of the subject of the generation and transmission of electrical energy, which is reserved for a third volume soon to appear), which heretofore has been scattered in a multitude of less comprehensive books and in the files of the technical press. The application of electricity to traction is so recent a development that no one has previously attempted to survey the whole field with the minuteness of the authors. Success has crowned their efforts and the work is so well illustrated that one without a knowledge of the French language can turn the pages with profit.

The two volumes are devoted to traction proper, under two principal divisions; that of the rolling stock and roadbed, and that of the manner of utilizing the motive power. To this are added a treatise in braking and appendices dealing with the cost, and the question of public safety.

Wherever possible, the authorities are cited, and this, together with the extended index, makes the work invaluable as a reference book. Price, 50 fr.

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### FREE RIDES IN BROKLYN.

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Through the courtesy of Frederick Uhlmann, receiver of the Brooklyn Elevated Railroad Company, we have received one of the free tickets distributed to the women of Brooklyn last month. The road has a very heavy traffic, mornings and evenings, but it is very light during the mid-day. In order to call the attention of possible shoppers to the advantages of the elevated as a means of reaching New York, the company mailed four orders for tickets to 15,000 women residing in the territory served by the Fifth avenue division, with a copy of a circular which was as follows:

DEAR MADAM: Possibly you are not aware that the shortest, quickest and most comfortable means of reaching the Fulton street shopping district, or Park Row, New York, is by the cars of the Brooklyn Union Elevated Railroad.

It is for this reason that I have taken the liberty of sending you the enclosed orders for tickets, feeling sure that once you have tried this route, you will find it to your advantage to continue using the same.

On presenting one of these orders at any station of the Brooklyn Union Elevated Railroad, or at the Park Row station of the Brooklyn Elevated in New York, between the hours of 9:30 a. m. and 5 p. m. (Sunday excepted), you will receive for same a ticket entitling you to a ride to or from New York, to any station of the Brooklyn Elevated.

Trusting that you will do me the favor of at least trying this route, I remain,

Very respectfully yours,

I. D. BARTON,  
General Superintendent.

The result was excellent, as travel on the Fifth avenue division at once increased in cash receipts from 5 to 10 per cent more than on the other divisions. Less than 20,000 of the 60,000 free tickets were redeemed.

## CONTROLLER FOR LAUNCHES.

The illustrations show a new controller such as was placed in the electric launch lately built for the Czar of Russia. The improvements were made by Justus Eck and Cecil Callow, two Englishmen, and the description of the controller recently appeared in "Lightning." The controller has a capacity for carrying currents of 150 amperes at 160 volts. This form is intended to insure a very rapid movement from point to point, preventing serious

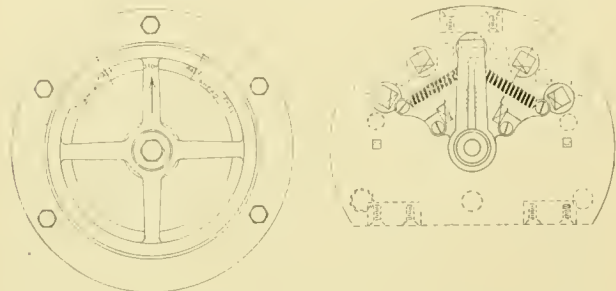


FIG. 1.

sparking, and centering the fixed and moveable contact parts at each change, thus obtaining a maximum current carrying capacity.

Fig. 1 shows a hand wheel, although a lever may be used for operation, and also the indicator plate. The hand wheel is rigidly fixed to the releasing finger, shown in the right hand cut of Fig. 1, and this is connected by two springs to two small plates which are attached to the controller shaft and drum. When the position of the controller is to be changed the releasing finger is moved to the next point by means of the hand wheel, the helical

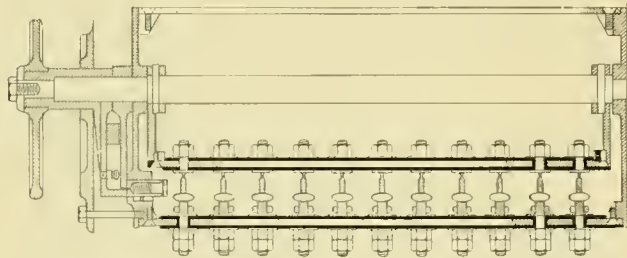


FIG. 2.

spring being stretched. When the spring bolt, shown in Fig. 2, is pressed back by the finger, the spring draws the plate forward and the controller drum is quickly drawn into the new position.

The controller cylinder consists of two end plates keyed to a bronze shaft, and upon these are mounted a series of brass bars corresponding to the number of movements of the controller, covered top and bottom and with ebonite bushings. The manner of bolting the fixed contact pieces to the controller case is shown in Fig. 2. The controller is constructed entirely of metal and ebonite insulation and is designed to withstand the most trying conditions of weather and climate.

A fire, which threatened for a time to prove quite serious, caused a loss of about \$2,000 in the Louisiana street power station of the Citizens' Street Railroad Company, of Indianapolis, on December 10. Traffic was stopped on four of the principal lines of the company for three hours.

There is not a street railway line in all China, but in a recent report John Fowler, United States consul at Chetoo, calls attention to the invitation of the council of Shanghai for tenders to construct and operate 23 miles of street railways in that city. All bids must be in by March 15, 1899, accompanied with a deposit of \$718. Any particulars regarding the concession may be had on application to Charles Mayne, engineer to the council, 23 Kiangse road. Shanghai is not only a very populous city but is the great emporium for all Asia. This concession is a valuable one and should be taken by an American company.

## BALTIMORE & NORTHERN.

As we go to press, and too late for verification, the report comes that a controlling interest in the Baltimore City Passenger Railway Company has been secured by the Baltimore & Northern road. The deal came in the nature of a surprise to all excepting the few who engineered it. That there was to be an amalgamation was pretty well understood, but it was all along conceded that the purchasers would be the Consolidated Company. The Baltimore & Northern has been merely a suburban feeder for the City Passenger. The purchasing syndicate is headed by Alexander Brown & Sons, and the price paid was \$96 a share.

## FIRE IN WASHINGTON.

The car shed of the Eckington & Soldiers' Home Railway Company, of Washington, D. C., was totally destroyed by fire together with 30 cars on December 3. The wooden building which contains the car shed, offices and repair shop is located on 5th and T streets in Eckington. The origin of the fire is unknown, and when it was discovered at 11:45 p. m. by the night foreman the flames had gained such headway that it was impossible to save anything in the building. The loss is roughly estimated at \$50,000 and only partially covered by insurance.

The destruction of the car shed was complete. The damage sustained amounts to about \$12,000. The shed contained 30 cars, including about 20 motor cars and trailers, six double deckers and four horse cars. All of these were lost in the fire. They were valued at \$36,000. The damage to the repair shop and minor equipments throughout the building will aggregate \$2,000. Eight cars, the property of the company, were on the street at the time of the fire. These were the only rolling stock saved. On the east side of the car shed, and lying almost against it, was a cylindrical tank, about 10 ft. long and 4 ft. in diameter, filled with Pintsch gas, which had been used for illuminating the cars during the time that the company was experimenting with compressed air for the purpose of using it as a motive power. The tank soon became heated to such an extent that the expanding gas forced the head out. Had the tank been more solidly constructed and able to withstand the expansion of the gas for a few minutes longer, an explosion would certainly have resulted. As it was, the gas in finding an escape became ignited and poured forth in a blue flame.

## STATE ASSOCIATION FOR VIRGINIA.

The Street Railway & Electric Association, of Virginia, was organized in Richmond on December 7, and the following officers elected: R. D. Apperson, president; E. R. Williams, vice-president; H. P. Woodson, secretary and treasurer.

The companies represented at the meeting were: Lynchburg & Rivermont Street Railway Company, City Street Car Company of Staunton, Roanoke Street Railway, Richmond Electric Light & Power Company, Richmond Traction Company, Norfolk Street Railway Company and Norfolk & Ocean View Railway Company.

The object of the association is the acquirement of scientific and experimental information, with a view of handling street car traffic to better advantage, and improvement of the service.

## A LIBRARY OF CHICAGO AUTHORS.

The Chicago Press Club is making a collection of the works of Chicago writers with the especial purpose of demonstrating to visitors to the so-called Windy City that Chicago is a literary center as well as a mart of trade. A. C. McClurg & Co. have presented the club with a set of their publications by Chicago writers, numbering 47 volumes, and including many names now of world-wide reputation. Herbert S. Stone & Co., Rand, McNally & Co. and other publishers have also made generous contributions, and the collection is now assuming very creditable proportions.



## HALF FARES.

Six new closed cars have been put in service on the Chattanooga (Tenn.) Electric Railway Company.

An elevated railway for transferring freight from the east and west side depots in Detroit is talked of.

There was a short strike on the Lima-Honeoye Falls (N. Y.) road last month, which was amicably settled.

It is announced that the Webster (Mass.) & Dudley Electric Railway has stopped running cars for the winter.

The Central Electric Railway Company is seeking franchises for an underground conduit railway in Kansas City, Mo.

The New York, New Haven & Hartford has built some new closed coaches, seating 80 persons each, for the electric third rail service.

Pending extensive repairs and improvements the management of the Petersburg (Va.) Electric Company proposes to return to horse traction.

Cuba is rapidly becoming Americanized. The night of November 16 there was a hold-up on the street railway between Havana and Jesus del Monte.

The average daily traffic of the South Side Elevated, Chicago, for November was 4,961 in excess of the average for November, 1897. The increase is 9 per cent.

The Akron (O.) Street Railway & Illuminating Company is to be reorganized in the course of the present month, it has been in charge of receivers for some time.

The Nyack (N. Y.) Traction Company by November 13 had received over 60 bids from contractors for the construction of nine miles of track, to be built before January 1.

The Metropolitan Street Railway Company, of Kansas City, Mo., on December 4, joined the Street Railway Accountants' Association, which now has 77 member companies.

The electric road from Columbus, O., to Grove City, in the building of which A. G. Grant has been the leading factor, was opened October 31 with elaborate ceremonies.

Among the numerous strikes of last month was one on the Pittsburg, Neville Island & Coraopolis electric road. The five motormen quit work and new men were employed.

It is stated that J. O. Hutchins, vice-president, and A. B. du Pont, general manager of the Detroit Citizens' road, have secured control of the Wyandotte & Detroit River Railway.

At the annual meeting of the stockholders of the Chicago City Railway Company next month, they will be asked to authorize an increase in the capital stock from \$12,000,000 to \$14,000,000.

The gross passenger earnings of the Brooklyn Rapid Transit Company's system for November, 1898, were \$446,501, an increase of \$28,683 over November, 1897, and of \$43,336 over November, 1896.

The employes of the Columbus (O.) Street Railway, of which W. F. Kelly is general superintendent, who have been in the service five years or more will receive new uniforms as Christmas gifts.

General Manager Gilbert, of the Chicago Traction Company, has ordered some machine tools which will be set up in the car barn and be driven by an electric motor. Hereafter all the repairs to the machinery and equipment will be made by the company.

The fire department was recently called out to extinguish a fire in the cable conduit of the West Chicago Street Railroad Company at the corner of State and Washington streets. The blaze was started by a workman dropping his torch into the grease in one of the manholes.

Reports from Rockland, Mass., state that Pepper & Register, owners of the Hingham Street Railway, are endeavoring to secure an amalgamation of all the street railway lines in the southeastern part of the state. The Brockton, Bridgewater & Whitman, the Rockland and Abington, and the Hanover roads are to be included in the system.

The Superior Rapid Transit Railway Company, of West Superior, Wis., has stopped the work of rebuilding its system to standard gage for the present; work will be resumed early in the spring. The total cost of rebuilding the track and equipping with rolling stock is estimated at \$350,000.

November 21 the stockholders of the various street railway companies that underlie the United and the Citizens' Traction Companies, of Pittsburg, met and re-elected the old boards of directors in each instance. There was no change in the directory of the United, and but one in the directory of the Citizens' Company.

The Atlantic City (N. J.) Electric Railway was sued by a passenger because the conductor refused to accept a ticket he tendered, and ejected him. The ticket was issued in 1889, and none of that kind have been in use for over six years. The case was compromised, as the conductor was ignorant that such tickets had ever been issued.

It was stated last month that the Ferro Carril Urbanos, the 25-mile street railway system in Havana, and the suburban villages of Cerro, Jesus del Monte, Castillo del Principe and Vedado, had been sold to an English stock company for \$1,600,000. The line is to be rebuilt and electricity adopted as the motive power.

The Pittsburg (Pa.) & Birmingham Traction Company has commenced a suit in equity against H. Sellers McKee and others, who were instrumental in rebuilding the road and equipping it for electric traction. It is charged that the company was defrauded by collusion between its officers and the contractors who did the work, and a declaration of trust and an accounting is asked.

The offices and charging rooms of the Chicago Traction Company are heated at small expense. The storage batteries are charged in the basement beneath the car barn, which, together with the engine and boiler rooms and offices, are all under one roof. Pipes are properly arranged in the basement and connected with the drain from the cooling tower where the exhaust steam is condensed. The passage of the hot water through the pipes heats the basement and is further cooled in this manner before it is pumped to the top of the tower again for condensing purposes. The offices and employes' rooms are heated from the exhaust steam.

A report of the first month's operation of the new electric lines in Glasgow shows that the cost was 13 cents per car-mile and the receipts 33 cents. This leaves a profit of 6 cents more per car-mile than when horse traction was in vogue.

At Neath, Wales, the corporation owns four miles of street railway track and has leased this to the British Gas Traction Company. The service is too infrequent and the traffic too light to justify an electric system and a compressed gas system has been adopted.

An English and German syndicate is now in control of the electric lighting and power business of Santiago, Chile. A large sum has already been spent on the plant and in developing water power on the Maipo river. Current from this source will be used for operating trolley lines in the city.

## ECHOES FROM THE TRADE

O. P. Hurford has been appointed the Chicago agent for the Diesel Motor Company of America, and has his headquarters at No. 418, The Rookery.

The firm of W. G. Nagel & Co. has been organized for the purpose of conducting a general business in electrical machinery, supplies and construction, in Toledo, O.

John A. Seely, of the firm of Belden & Seely, electric and steam railway contractors, of Syracuse, N. Y., is now located in Syracuse, his address being 601 Granger block.

The M. C. Bullock Company, of Chicago, has recently published a very interesting pamphlet on the Wilians type of engine; it is entitled "The Central Valve Engine."

A recent publication of the Westinghouse Company is a small pamphlet, entitled, "The Modern Round House Turntable," and illustrates the Westinghouse motor for turntables and some recent installations of the company.

The VanWagoner & Williams Hardware Company, of Cleveland, reports that trade is excellent and it is now very busy. Several new machines have just been placed in its shops to meet increased demands for products.

The Fostoria Incandescent Lamp Company, of Fostoria, O., has established an eastern office in the White Building, 95-97 Liberty street, New York. This is also the location of the eastern office of the Crouse-Tremaine Carbon Company.

The Niles Tool Works, of Hamilton, O., has issued its annual catalog. It comprises 571 pages, bound in cloth covers, and profusely illustrated, and is one of the most extensive catalogs ever issued by any manufacturing company.

The Hoppes Manufacturing Company, of Springfield, O., has just issued a very handsome illustrated catalog of the Hoppes steam separators and oil eliminators made by it. The two types, the horizontal and the vertical, of this apparatus, were illustrated and described in the REVIEW for May, page 320.

The torpedo boat "Davis," built at the Wolf & Zwicker Iron Works, Portland, Ore., on her trial trip made an average speed of 23½ knots, which was one knot above her contract speed; the revolutions averaged 382 per minute. The engine forgings and shaftings for this boat were made by the Bethlehem Iron Company, South Bethlehem, Pa.

"The Westinghouse Compound Engine" is the title of a recent publication of the Westinghouse Machine Company. It is a handsomely illustrated pamphlet of 94 pages, descriptive of the single acting compound engines of the company, with which are briefly mentioned some of the other types of engines and kindred apparatus built by the company.

Warren Webster & Co., of Camden, N. J., which owns and operates the Webster system of steam heating and the Webster vacuum feed water heater and purifier, has recently issued to the trade a circular, which contains an article by the late Edgar W. Nye on the experience of a man with a steam radiator, and an explanation by Webster & Co., of how that radiator should have been installed.

The Partridge Carbon Company, of Sandusky, O., advises us that there never was a time when its works were so busy as they are at present. This company makes the best quality of goods, and it has such a firm grip on the street railway trade that the

representative of one of its possible competitors said to us recently: "We don't think it worth while to go after what the Partridge people leave in the street railway field."

The Pearson Jack Company, 64 Federal street, Boston, has recently published a circular which gives a list of the electric roads using the Pearson replacing jacks, and a number of very flattering letters from managers. The company states that its jacks are used by 200 electric and 100 steam roads in the United States, and are also used extensively abroad. This jack is quick-working, and the weight is always under perfect control.

We very much regret that by an unfortunate mistake incident to the confusion of moving our offices there was added to the statement last month that J. G. White & Co. were asking bids for a road in Perth, Australia, a portion of an article announcing the appointment of a receiver for an entirely different concern. The error was obvious on a careful reading and we trust that none were misled thereby.

The Thanksgiving greeting of the Providence Consolidated Car Fender Company was in the form of a unique and artistic folder, which was mailed to the friends and patrons of the company. The inner pages presented two luscious pictures, one of a turkey baked to a turn and the other of apples, cider, mince pie, and the other "fixings" usually accompanying a turkey dinner. A receipt for a mince pie and a needle threaded for sewing up the turkey accompany the folder.

J. A. Fay & Co., Cincinnati, Ohio, the largest manufacturers of high-grade wood-working machinery in the world, have just sent us an elegant folder, printed in red and green, showing some fifty of their new improved machines, which they have recently brought out, for working wood, and they advise us that if you will write them for one, mentioning the REVIEW, they will send you one free, postpaid. Write at once, so you will be sure to get one before they are all gone.

The Pennsylvania Steel Company has supplied rails to the Galveston City Railroad Company for relaying 3½ miles of track. The 40-lb. rails were worn out and the new rails will be 60 lb., 60 ft., A. S. C. E. standard and the Pennsylvania Steel Company's No. 244 sections. The special joints will be furnished by the Continuous Rail Joint Company. Receiver R. B. Baer sends information that some new closed cars have also been purchased. They are each 18 ft. 6 in. inside, 28 ft. over all, vestibuled and cross seats with an aisle in the center.

At the proving station at Indian Head, Md., where the big guns are tested, the Government has had in use for some time an electric railway connecting the various buildings and workshops scattered considerable distance apart. It is used chiefly for hauling heavy materials, and when under improvement last month it was decided to adopt the Edison-Brown plastic bond. Harold P. Brown, manager of the company, was agreeably surprised to receive an order from the Government for bonds for 800 pairs of joints, as it was not known the order was to be given, nor had he been requested to bid. He naturally is pleased at this unsolicited endorsement by so high an authority.

The Jeffrey Manufacturing Company, of Columbus, O., has just distributed the January, 1899, edition of catalog 50 on "Chain Belting and Steel Cable, Elevating and Conveying Machinery." It contains 225 pages and is profusely illustrated. Since the last publication several new specialties have been added to the company's list. The spiral conveyors, elevator brackets, Jeffrey-Columbian separator, bolter and screen and the Jeffrey century belt conveyor system may be noted.



The American Vitrified Conduit Company, of New York, of which C. J. Field is manager, advises us that on November 5 it moved its offices to the Monroe-Taylor building, 39-41 Cortlandt street, New York City. The company has practically unlimited factory facilities for making conduits and contracts for the complete installation of underground conduit systems for street railways, lighting, telephone and telegraph companies. The conduits are smooth glazed vitrified, and are proof against acid, fire, gas and water.

C. O. Baker, Jr., president of the Electrical Exhibition Company, has signed a lease of the Madison Square Garden for another electrical show to be held during May of next year under the auspices of and in connection with the twenty-second convention of the National Electric Light Association. Although the last show occurred in May when the war interest was most intense it drew large crowds of people. Electrical development is so fast nowadays and the newspapers have described so many of the newer and more wonderful inventions that an exceedingly interesting and successful show is looked for.

W. G. Price, formerly with the Chicago City Railway Company, and inventor of the well known and successful Price brake, has become superintendent of the Peckham Company and will give special attention to the manufacture of his brake. The Peckham Company is now ready to quote prices on this brake, and with its fine manufacturing facilities is in position to fill orders promptly. The brake is doing splendid service on several hundred cars on the Chicago City, and has already been adopted by many other roads. With the new arrangement for manufacture and supply its rapid adoption generally is assured. It is simple in construction, powerful in operation and not expensive in first cost.

There is now before the House of Representatives a bill to authorize an exposition of American manufactured goods, suitable for export, in Philadelphia in 1899, under the auspices of the Philadelphia Commercial Museum, and solely in the interest of American business houses. The bill passed the Senate, but could not be reached for consideration in the House at the last session, because of the press of war measures. This exposition should



INTERIOR OF DUPLEX CAR.

The Safety Third Rail Electric Company is building a road between the Manhattan Hotel and the Oriental Hotel at Manhattan Beach, New York. The road is to be equipped with "Duplex" cars, built by the Duplex Car Company, of New York. The "Duplex" car, it will be remembered, is convertible and can be changed while in motion to suit any condition of weather.

The economy and comfort of this arrangement are becoming daily better appreciated, "Duplex" cars being now in use on the Mansfield & Easton, Boston & Newton, Norton (Mass.) and Concord (N. H.) street railways, and the lines of the Bergen County Traction Company. Cars are now building for other roads.

The accompanying illustration shows a view of the interior of the car.

The Forest City Electric Company, of Cleveland, O., has been compelled to purchase a larger factory, in order to meet the increase in both its foreign and domestic trade. At a conservative estimate the new factory will treble the capacity of the company. The company was fully installed by the middle of December and will be better able than ever to make prompt shipments, which is one of the important factors in this trade. The commutator bars of this company are in use on all styles of machine and it has now nearly 2,000 different patterns, and is constantly adding new ones.

have the hearty support of business interests as its object is to overcome two causes that have heretofore prevented America getting the export trade that properly belongs to her: 1. The ignorance of American makers of the specific requirements of foreign markets. 2. The ignorance of foreign buyers as to the superiority of American products.

The remarkable advancement in the manufacture of tin plates in this country has been noted in the technical and in the news papers. Some of the largest plants in the world are in the United States, and among the most important are those of Merchant & Co., manufacturers, of New York, Chicago, Philadelphia and Brooklyn. The tin plates for roofing purposes are of the best quality, the brands being as follows: "Merchant's Old Method," "Merchant's Roofing," "American Old Style," "Camaret" and "Alaska." These brands are carried in stock in 10 and 12 thickness, and 14 by 20 in. and 20 by 28 in. and 112 sheets to the box. They are of the very finest quality and made by the palm oil process with the lead-tin alloy evenly distributed over the entire surface of the steel plates.

The P. Wall Manufacturing Company, of 940 Preble avenue, Allegheny, Pa., is now building two additions to its factory; each is 90 ft. by 140 ft. The business of the company is very good,

and the increased factory facilities will place it in the best of shape to promptly fill all orders for gongs, steel oilers, engineer's sets, and its other specialties.

Frederick Saxelby, New York agent of the Siemens-Halske Company, is now the representative of the Bullock Electric Company in that territory.

The New York office of the Corning Brake Shoe Company, of Buffalo, is in charge of Francis Granger. The office has lately been moved to the Havemeyer building, 26 Cortlandt street.

The new factory of John A. Roebbling's Sons Company, of Trenton, N. J., for making insulated wires and conductors for car wiring, lead encased power cables, submarine cables, and in fact every variety of rubber insulated conductors, is now in full operation.

The Phoenix Iron Works, Meadville, Pa., have received an order for three 300-h. p. tandem compound condensing engines and one 600-h. p. cross compound condensing engine for Laughlin & Co., of Pittsburg; these engines to be direct connected to generators.

The fine switchboard installed in the reconstructed station at 13th and Mt. Vernon streets, of the Union Traction Company, Philadelphia, was furnished by Albert & J. M. Anderson Manufacturing Company. It is one of the largest and most complete switchboards ever installed.

The Bibber-White Company, of Boston, has secured the service of Charles D. Kirkland, who heretofore has been identified with the sales department of the C & C Electric Company. Mr. Kirkland will be the New York representative of the Bibber-White Company and will have an office at 129 Greenwich street.

The McGuire Manufacturing Company has received an order from the Northwestern Elevated Railway Company, of Chicago, for 294 trucks to be delivered March, April and May of this coming year. The contract involves \$100,000 and is the largest contract for trucks ever let by an electric elevated railroad.

In the United States circuit court at Boston a suit has been brought by the Electric Storage Battery Company against the Hatch Storage Battery Company. An injunction is sought restraining the defendant from manufacturing and selling patented improvements for making storage cells and storage battery plates.

As a result of the consolidation of the Westinghouse Electric & Manufacturing Company and the Walker Company, H. B. Gay, who was formerly the Baltimore representative of the latter company, will now be the representative of the combined companies in Maryland, Delaware, Virginia and the District of Columbia. The office will be at 106 East German street, Baltimore.

The Krajewski-Pesant Company has established a wholesale and retail establishment at Calle O'Reilly 150, Havana, Cuba, and is the sales agent for a number of American manufacturing concerns. Norman H. Schneider, who has previously been the export agent of the Western Electric Company, is now in Havana in the company's interests and has already started a good business.

During the past month the Taunton snow plows have been put to a severe test by the snow storms in the east. The many lines which were equipped with these plows were unusually successful in keeping the tracks clear of snow. Through Wendell & MacDuffie, agents for the Taunton Locomotive Manufacturing Company, orders have been received from the Brooklyn Heights Railroad Company, the Union Railroad Company, of Providence, the Boston Elevated Railway Company, and an order for 12 plows from the Metropolitan Street Railway Company, of New York.

During the past year the business of the Swarts Metal Refining Company, 20 North Desplaines street, Chicago, has made great advancement in all lines. The company now has a branch office in the City of Mexico and its trade has become international. The business was established in 1885 by Seymour Swarts, president of the company, and was incorporated three years ago. The company buys at market prices worn out trolley wheels, copper wire, brake handles, and all kinds of brass, copper and platinum articles. The company manufactures and refines high-grade bab-bitt, solder, ingot brass, pig lead and tin.

### HARRISBURG FOUNDRY & MACHINE COMPANY.

It was announced November 12, that the Harrisburg Foundry & Machine Company, located in East Harrisburg, Pa., had purchased a tract of five acres of land in West Harrisburg and would shortly ask for bids for the construction of a large two-story brick and stone building 260x140 ft. on the new site. The stockholders recently voted to increase the capital stock so that \$200,000 might be put into the new plant, which will be modern in all its features and well adapted to handling the large business of the concern. The plans were prepared by W. R. Fleming, vice-president and general manager of the company.

### KANSAS CITY NOTES.

Fenders are being tested in Kansas City, Mo.

The Northeast Electric Railway Company will soon begin the reconstruction of its entire system. The track and equipment are in bad condition and will be renewed. More economical machinery will be installed in the power station.

The Brooklyn Avenue Railway Company is sadly in need of a new lease on life and must either sell out or start over on a new basis.

### HUNTINGTON, W. VA., LIGHT & RAILWAY COMPANY.

In an article on the Consolidated Light & Railway Company, of Huntington, W. Va., a local paper speaks in the highest terms of J. L. Caldwell, president, and W. W. Mageon, general manager, to whose energy and ability the prosperous condition of the company is due. The company operates the electric railway, some 10 miles of track, and a transfer line between depots, on which horse cars are used, and supplies the gas and electricity used for lighting purposes.

### CLEVELAND ENGINEERS' CLUB.

At the meeting of this club, November 8, Oscar Textor, of the Cleveland Chemical Society, presented a paper entitled "A Review of Tests on Steel Rivets." The material tested was basic open hearth steel, and was tested for tensile and shearing strength, and by nicking and bending cold, and for behavior under the hammer. The results were said to be very satisfactory and the conclusion was that with proper manipulation such steel rivets are fully equal to the best wrought iron rivets and have a superior tensile strength.

Papers have been filed consolidating the North End Street Railway Company, the Fort George & 11th Avenue Railroad Company and the Fort George Extension Railway Company under the name of the Fort George & 11th Avenue Railroad Company, capital stock \$3,000,000. The directors are: John T. Little, Jr., Ambrose F. McCabe, Fred C. Garrick, Frank F. Ogston and Sharon Graham, of New York City; Clement McCumming, of Vonkers; Charles A. Gilbert, of White Plains; William A. Dibbs, of Brooklyn; and D. C. Moorehead, of Jamaica.



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<b>Van Wagoner &amp; Williams Hardware Co.,</b> Drop Forged Copper Commutator Segments.	<b>Cleveland, O.</b>	<b>Partridge Carbon Co.,</b> Self-Lubricating Motor and Generator Carbons.	<b>Sandusky, O.</b>
<b>J. M. Atkinson &amp; Co.,</b> Flexible Horse Shoe Rail Bonds.	<b>Chicago, Ill.</b>	<b>W. T. C. Macallen Co.,</b> Standard Overhead Insulation.	<b>Boston, Mass.</b>
<b>American Electric Heating Corporation,</b> Electric Car Heaters of Every Design.	<b>Boston, Mass.</b>	<b>Bradford Belting Co.,</b> "Monarch" Insulating Paint.	<b>Cincinnati, O.</b>
<b>American Rail Joint &amp; Manfg. Co.,</b> "Boltless" American Rail Joints.	<b>Cleveland, O.</b>	<b>Sterling Varnish Co.,</b> Sterling Extra Insulating Varnish.	<b>Pittsburg, Pa.</b>

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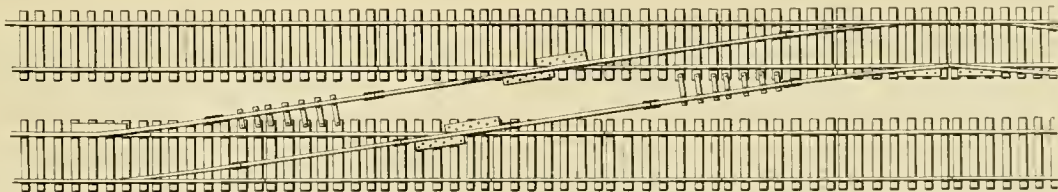
### A PORTABLE CROSS-OVER.

The accompanying illustration clearly shows the arrangement of a portable emergency cross-over which was designed by F. R. Coates, roadmaster of the New York division of the New York, New Haven & Hartford Railroad and which is now controlled and manufactured by the Q & C Company.

The construction of the cross-over is very simple, as is also the assembling of it. It has been possible, in daylight, to pick up the various parts, place them on the track and have an engine over same in 6½ minutes. At night, it has been made ready for use, including unloading, in 20 to 25 minutes. The average time of putting together, including unloading from cars, in daylight,

The plates for making tie extensions are attached to the base of rail by clips, and are easily adjusted to fit the ties. The slots in the short angle bars are so constructed that by simply taking out one bolt in each bar and sliding same back, that the middle piece of frog can be lifted out, and replaced when it is desired to use the cross-over.

November 8 a car of the United Traction Company, Pittsburg, Pa., running between the city line and Six Mile Ferry on the Monongahela river, jumped the track on a 60-ft. embankment near Baldwin Station; the car ran down the steep hill to within a short distance of the railroad track at the bottom. There were 14 passengers, none of whom was seriously injured.



Q & C PORTABLE CROSS-OVER.

has been 15 minutes. The change can be made from straight track to cross-over in one minute. By the use of various size blocks under the frogs and raised switch points, it can be adapted to any size rail.

If it is desired to do away with split switches at outlying sidings which are used infrequently, the switch on this cross-over makes a very satisfactory one indeed, as you then have an unbroken main line, as far as this portion of the switch is concerned. The parts of the cross-over are all numbered so as to render it impossible to make a mistake in putting it together.

November 16 a car of the Tacoma (Wash.) Railway & Motor Company was derailed in descending a steep grade on Stellacon road, five miles from the city. The car was wrecked by striking the side of a cut, and the seven persons on board were all more or less injured.

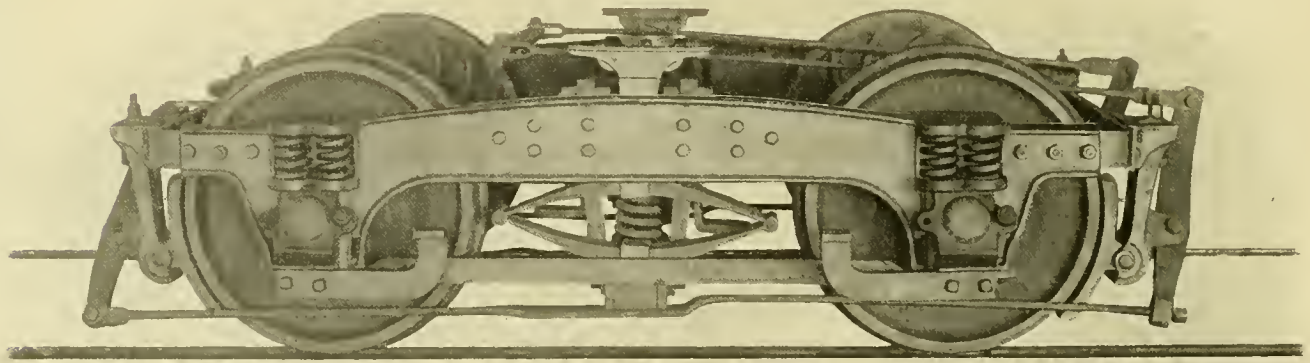
The Binghamton (N. Y.) Railroad Company, of which G. Tracy Rogers is president and J. P. El. Clark general manager, has leased a pond and will have an ice skating rink. Arc lights will furnish illumination at night and music will be provided.

## MCGUIRE NO. 35 TRUCK.

The accompanying illustration shows the McGuire No. 35 truck to be used on the Northwestern Elevated Railroad. The truck is made of steel throughout, excepting the journal boxes and brake shoes, which are of cast iron. The frame consists of three pieces—the transom and two side pieces. The side pieces are made of an I section and have the spring caps cast in them and rest upon the oil boxes through the medium of four long helical springs, the journal boxes having spring seats cast in them. The area of the section of the side is approximately 15 sq. in. The side is planed and the transom end which joins it is machine fitted and rests on a shelf or bracket cast on the side, thus taking the shearing stress off the bolts. In addition, the bolt holes are reamed and the bolts turned and driven. The bolster having a base of 30 in. and the two end sills being made of 4x4 in. angle iron, makes the whole frame the strongest that could possibly be devised to resist the diagonal stresses.

The McGuire Company specifies its own mixture in steel, analysis of which is as follows:

Phosphorous .....	.014 per cent;
Sulphur .....	.022 per cent;
Manganese .....	.72 per cent;
Silicon .....	.052 per cent;
Carbon .....	.22 per cent.



MCGUIRE TRUCK FOR NORTHWESTERN ELEVATED, CHICAGO.

A physical test of 100,000 lbs., without permanent set, is imposed upon each side piece and transom, with a deflection of 3-16 in. The maximum load upon this truck will be approximately 23,000 lbs., hence the working factor of safety inside the elastic limit is very near 10.5. The bolster is of M. C. B. standard swung upon four links. It is made of cast steel of the double I beam pattern, 10 in. square, and, being supported near the ends, puts the load almost entirely upon the side bars. Each bolster is subjected to a shop test of 120,000 lbs. with  $\frac{1}{4}$  in. deflection and no permanent set. The transom has been given a permanent set of  $\frac{3}{4}$  in. without rupture under a stress of 168,000 lbs., while the swing bolster, tested in the same manner with the load applied in the middle and supported at the two extreme ends, has taken only  $\frac{3}{8}$  in. permanent set under a stress of 132,000 lbs., and ruptured at 155,000 lbs. The axles are to be Krupp steel,  $\frac{5}{4}$  in. in diameter, and steel tired wheels are to be used.

It will be seen from the above that this frame is amply strong for the heaviest kind of steam or electric railway service. This, together with the demonstrated fact that it rides as well as a truck possibly can, puts it in the front rank of passenger coach electric trucks and all that can be desired for elevated railways where safety is the first principle.

The patent under which this truck is built, is the foundation of the steam railway car truck built by the Cloud Steel Truck Company, for which it pays a royalty to the McGuire Company. Inasmuch as John W. Cloud is recognized as one of the most experienced engineers in steam railway service, and the McGuire Company occupies a similar position in the electric railway field, the No. 35 truck should be all that is desired.

Other truck builders of the country bid on this Northwestern work, and it is stated that three at least were lower than the McGuire Company. It is, therefore, plain that price was not the only ground upon which the award was made.

## PURCHASE AND CONSOLIDATION OF THE ST. LOUIS RAILWAYS.

The St. Louis papers insist with seemingly good authority that the Hamilton syndicate of street railway lines has been sold to Corwin H. Spencer and Charles F. Orthwein, president and vice-president respectively of the Southern Electric Railway Company, of St. Louis. This is one of the most important railway deals which has taken place in the west in recent years. The National Railway Company, otherwise known as the Hamilton syndicate, is a Chicago corporation owning and operating the Broadway cable, Easton avenue electric, Cass Avenue & Fair Grounds,

Northern Central, Union, Southwestern and Baden & St. Louis roads.

All these lines have been owned by the National Railway Company except the Broadway cable, 67 per cent of the stock of which was held by the company. The 81 miles of track are divided as follows: Baden & St. Louis, seven miles; Cass Avenue & Fair Grounds, 35 miles; Citizens' Electric, 17 miles; St. Louis (Broadway cable), 11 miles, and the Southwestern Electric, 11 miles. It is stated that the purchase price is \$3,000,000, which is on a basis of \$120 for the stock of the National Railway Company.

This company was organized in 1889, under the laws of Illinois, with an authorized capital stock of \$2,500,000, of which \$2,479,000 was issued and paid up. The income of the company was from the dividends of the railway companies it controlled, and the net earnings for several years past have been, 10.01 per cent in 1892, 9.08 per cent in 1893, 8.85 per cent in 1894, 8.01 per cent in 1895, 9.22 per cent in 1896, and 8.45 per cent in 1897. Dividends of 7 per cent per annum have been paid quarterly until 1895, when they were reduced to 6 per cent. In 1897 there were carried on the various lines 29,359,515 passengers, and the gross receipts were \$1,467,976. The officers of the company are: D. G. Hamilton (Chicago), president; E. Buckingham, vice-president; Wm. M. Adams, secretary, and Frank W. Smith,



treasurer. The operating departments of these affiliated lines have been for many years under the able management of Capt. Robert McCulloch.

The alleged purpose of the purchase of these lines by Messrs. Spencer and Orthwein is that they may be combined with the lines of the Southern Electric Railway Company, and greater economy in operation thereby effected. There are rumors that this combination is only the stepping stone to a greater consolidation. The Lindell Railway has been granted by the city a 50-year extension to its franchises and the right to consolidate with the Missouri Railroad Company. John Scullin, president of the Union Depot Railroad Company, is in New York negotiating with financiers with the view of consolidating the Lindell and Missouri systems, having 96 miles of track, the Union Depot, with 73 miles, the Hamilton syndicate with 81 miles, and the Southern system with 22 miles of track. The Widener-Elkins syndicate will eventually gain control of these properties, it is believed. These various reports cannot be confirmed at this date. At the office of the National Railway Company, in Chicago, it is admitted that negotiations have been pending for a month, but it is stated that no sale has been actually effected.

**HEAVY TRAFFIC AT OMAHA.**

The Trans-Missouri Exposition held at Omaha, Neb., was open for five months and the attendance aggregated 2,600,000. Naturally the traffic of the street railways was very greatly increased; the Omaha & Council Bluffs Railway & Bridge Company frequently carried between 30,000 and 40,000 persons per day between the two cities. From the beginning of the summer to the present time this company has not had an accident of any consequence, notwithstanding that a great number, possibly the greater portion, of the passengers were unaccustomed to electric transit, and therefore difficult to care for without accident.

Some might call this good luck, but in fact it was the result of the care exercised by the company. W. S. Dimmock, general superintendent of the company, in response to a request as to the methods pursued, advises us that during the periods of particularly heavy traffic, jubilee week and McKinley week, the tracks were patrolled at night, one man having charge of four to five blocks. This road for two or three miles is through a sparsely inhabited district, where the speed is high, and this fact as well as the heavy traffic led the company to take every possible precaution with the result, as stated, that there were no accidents.

It is quite possible that the exposition will be held again in 1899, as the success of the past summer was so gratifying.

**FIRE AT CLEVELAND.**

December 1, the car barns of the Big Consolidated street railway, of Cleveland, at the corner of Central avenue and Kennard street, were partially destroyed by fire, which broke out in a small workshop in the rear of the building at 10:45 a. m. The building is of brick, two stories high, and separated into two parts by an alleyway. The fire was confined to one side of the building; the loss was estimated at \$4,500, which includes three cars destroyed.

**NEW LINE IN BIRMINGHAM, ALA.**

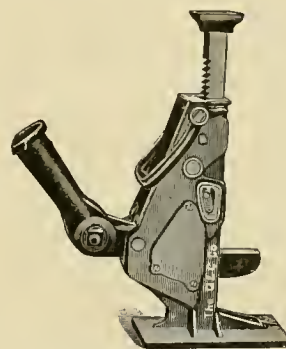
It is announced that an electric line is to be built from Jonesville through North Birmingham, to Sayreton, and thence to what are known as the Thomas mines. It is alleged that the Birmingham Railway & Electric Company is behind the project, but General Manager J. B. McClary will not confirm this.

A car of the United Traction Company operating on a branch line in Allegheny, Pa., on November 29, left the track while descending a steep grade and ran into the front of a building. Three persons were more or less cut and bruised.

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USED INSIDE or OUTSIDE of RAILS.

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## PERSONAL.

President C. L. Rossiter and the other officers of the Brooklyn, Queens County & Suburban were last month re-elected.

Sidney H. Short has resigned the second vice-presidency of the Walker Company and is expecting to take a trip to Europe.

Michael J. Kehoe, one of Roosevelt's rough riders, is now with the Fort Wayne (Ind.) Consolidated Electric Company as electrician.

S. C. Grier and C. W. Dahlinger have been re-elected president and secretary, respectively, of the Youngstown (O.) & Falls Electric Railway Company.

J. V. E. Titus, secretary of the Garton-Daniels Electric Company, of Keokuk, Ia., called last week on the REVIEW, on his way to New York on business.

Alfred Skitt was elected vice-president of the Manhattan elevated, New York, and assumed his duties November 23. He represents the Vanderbilt interests.

P. A. B. Widener is president and William L. Elkins a director of the Philadelphia Exposition Association which has now before Congress a bill for an exposition in Philadelphia in 1899.

Levi Weiskopf and Alfred Hill have been re-elected president and treasurer, respectively, of the Dayton & Xenia Traction Company, which will operate an electric road between those points.

E. E. Hawkins, of East Patchogue, L. I., formerly with the Flushing Electric Railroad, has been appointed superintendent of the New Platz & Walkkill Valley Railroad, New Platz, N. Y.

At the annual meeting of the Buffalo Railway Company, H. M. Watson was re-elected president, and H. H. Littell, vice-president and general manager. Mr. Littell was also re-elected president and general manager of the Buffalo Crosstown Railway, which is operated by the Buffalo Railway.

James Ross, vice-president of the Montreal Street Railway Company, has returned after his extended visit in England. Mr. Ross states that, without wishing to cast any reflections upon the municipal bodies of Great Britain as regards the slow manner in which they move, it is a fact that most of the cities are extremely conservative about changing from horse to electric traction.

Frank X. Cicott landed in San Francisco a few weeks ago on his return to America from a trip around the world, in which he has been studying foreign street railway conditions and possibilities. On December 8 he sailed from San Francisco for Central America and the Isthmus of Darien, and will return to New York via Panama, by which time he will have made a complete circuit of the globe.

Col. D. B. Dyer, president of the Augusta (Ga.) Railroad & Electric Company, has been appointed on the staff of Governor Candler of Georgia, an honor which is all the greater because of the fact that Col. Dyer is a staunch republican in politics, while the governor is a democrat. Col. Dyer was one of the Georgia commissioners to the Omaha Exposition, and devoted over a month of his time in that work without compensation.

L. J. Forget, who has been president of the Montreal Street Railway Company since 1892, is closely allied with a number of the largest business enterprises of Canada. He is the senior partner of L. J. Forget & Co., bankers and brokers; president of the Richelieu & Ontario Navigation Company, and a director of the Royal Victoria Life Insurance Company. Mr. Forget has served for two terms as president of the Montreal Stock Exchange, and is now a director of the Notre Dame Hospital and vice-president of the Board of Governors of Laval University. He was called to the Canadian Senate in 1896.

## OBITUARY.

Judge John W. Showalter, of the United States circuit court, died in Chicago, December 10, of pneumonia. Judge Showalter was appointed in February, 1895, and was an able, hard-working and conscientious jurist, whose untimely death is greatly lamented.

S. M. Thomas, president of the Taunton & Brockton Street Railway Company, died suddenly at his home in Taunton, Mass., November 21. Mr. Thomas had been identified with the street railways of Taunton for many years, and that city, in his death, loses one of its most enterprising citizens. He leaves a widow and two children.

Dewitt C. Cregier died in Chicago on November 9. Mr. Cregier was born in New York City in 1829; he removed to Chicago in 1853 to superintend the erection of the first pumping machinery for the water works. He remained chief and designing engineer for this department for 25 years, and was later city engineer and then commissioner of public works; he resigned from this latter position in 1886 to become manager of the West Chicago Street Railroad, and continued there until the property was sold to Philadelphia capitalists. From 1889 to 1891 Mr. Cregier was Mayor of Chicago. In 1894 he was appointed superintendent of the United States Indian Warehouse in Chicago.

William E. Hale, formerly president of the Hale Elevator Company, died at his residence in Chicago on November 16, at the age of 63. Mr. Hale was born in Bradford, Mass., and came west in the sixties, locating at Beloit, Wis.; a few years later he removed to Chicago. Mr. Hale was especially interested in the missionary work of the Congregational church and also in Beloit College, at Beloit, Wis., to which he had made large gifts. In the street railway world he was known as one of the large owners in the Toledo Traction Company. Mr. Hale's will directs that his heirs hold \$300,000 of Toledo Traction stock in trust as a benevolent fund, and devote the income to such charities as they may see fit.

## IMPROVEMENTS IN LEAVENWORTH.

The semi-annual meeting of the directors of the Leavenworth Electric Railroad Company was held in Leavenworth, Kan., December 2. President Newman Erb was absent, on account of illness in his family, but Vice-President H. N. Smith, of Boston; Secretary J. P. Edrington, of Memphis, Tenn., and Captain W. D. Bethel, of Denver, were present. E. E. Coombs, who has been acting manager since the resignation of L. M. Erb, was made manager.

Although the system is being operated in a satisfactory manner the directors considered some improvements. The shops now in use are too small and are located on leased-ground. The company owns a half block of ground in another part of the city and will likely build new shops and a car barn, at a cost of about \$10,000.

The construction of a new line was considered, extending through the city north and south on 4th street, one square west of the 3rd street line, and connecting with it at the north and south limits of the city, forming a loop. This would facilitate the handling of cars between the city and the fort on the north and the Soldiers' Home on the south. Should this plan be carried out the shops and car barn would be at the south end of the loop.

The Chicago City Railway Company strung No. 00000, figure 8 trolley wire on its Clark street line, about two years ago, but it has proven unsatisfactory. Although the poles, settings and span wires were of the very best construction, the wire was so heavy that it sagged too much between suspensions. During the time the 16th street viaduct was being constructed and this route was closed No. 00 trolley wires were strung and the heavier wire was annealed by heating it and dropping it in water, and then used for return feeders.













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